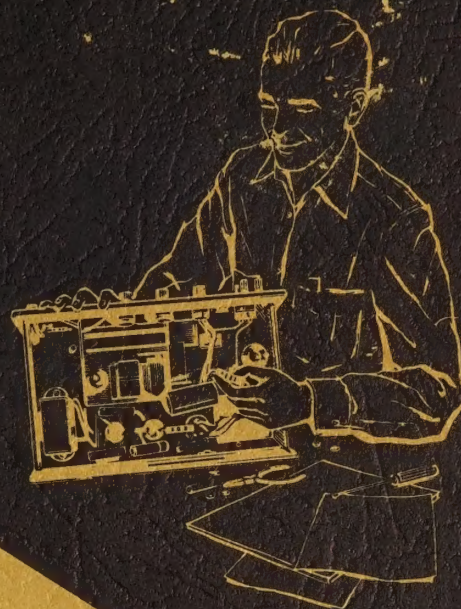


PRICE \$1.00



Assembling
and Using Your...

Heathkit

**TUBE
CHECKER**

MODEL TC-2

HEATH COMPANY

A Subsidiary of Daystrom Inc.

BENTON HARBOR, MICHIGAN

STANDARD COLOR CODE — RESISTORS AND CAPACITORS

<div>AXIAL LEAD RESISTOR</div> <div><div>Brown — Insulated</div><div>Black — Non-insulated</div></div> <div><p>Wire wound resistors have 1st digit band double width</p></div>	<table><thead><tr><th>INSULATED UNINSULATED Color</th><th>FIRST RING BODY COLOR First Figure</th><th>SECOND RING END COLOR Second Figure</th><th>THIRD RING DOT COLOR Multiplier</th></tr></thead><tbody><tr><td>BLACK</td><td>0</td><td>0</td><td>None</td></tr><tr><td>BROWN</td><td>1</td><td>1</td><td>0</td></tr><tr><td>RED</td><td>2</td><td>2</td><td>00</td></tr><tr><td>ORANGE</td><td>3</td><td>3</td><td>,000</td></tr><tr><td>YELLOW</td><td>4</td><td>4</td><td>0,000</td></tr><tr><td>GREEN</td><td>5</td><td>5</td><td>00,000</td></tr><tr><td>BLUE</td><td>6</td><td>6</td><td>000,000</td></tr><tr><td>VIOLET</td><td>7</td><td>7</td><td>0,000,000</td></tr><tr><td>GRAY</td><td>8</td><td>8</td><td>00,000,000</td></tr><tr><td>WHITE</td><td>9</td><td>9</td><td>000,000,000</td></tr></tbody></table>	INSULATED UNINSULATED Color	FIRST RING BODY COLOR First Figure	SECOND RING END COLOR Second Figure	THIRD RING DOT COLOR Multiplier	BLACK	0	0	None	BROWN	1	1	0	RED	2	2	00	ORANGE	3	3	,000	YELLOW	4	4	0,000	GREEN	5	5	00,000	BLUE	6	6	000,000	VIOLET	7	7	0,000,000	GRAY	8	8	00,000,000	WHITE	9	9	000,000,000	<div>DISC CERAMIC RMA CODE</div> <div><div>5-Dot</div><div>3-Dot</div></div> <div></div>
INSULATED UNINSULATED Color	FIRST RING BODY COLOR First Figure	SECOND RING END COLOR Second Figure	THIRD RING DOT COLOR Multiplier																																											
BLACK	0	0	None																																											
BROWN	1	1	0																																											
RED	2	2	00																																											
ORANGE	3	3	,000																																											
YELLOW	4	4	0,000																																											
GREEN	5	5	00,000																																											
BLUE	6	6	000,000																																											
VIOLET	7	7	0,000,000																																											
GRAY	8	8	00,000,000																																											
WHITE	9	9	000,000,000																																											
<div>RADIAL LEAD DOT RESISTOR</div> <div></div>	<div>5-DOT RADIAL LEAD CERAMIC CAPACITOR</div> <div></div>	<div>EXTENDED RANGE TC CERAMIC HICAP</div> <div></div>																																												
<div>RADIAL LEAD (BAND) RESISTOR</div> <div></div>	<div>BY-PASS COUPLING CERAMIC CAPACITOR</div> <div></div>	<div>AXIAL LEAD CERAMIC CAPACITOR</div> <div></div>																																												

The standard color code provides all necessary information required to properly identify color coded resistors and capacitors. Refer to the color code for numerical values and the zeroes or multipliers assigned to the colors used. A fourth color band on resistors determines tolerance rating as follows: Gold = 5%, silver = 10%. Absence of the fourth band indicates a 20% tolerance rating.

The physical size of carbon resistors is determined by their wattage rating. Carbon resistors most commonly used in Heath-kits are 1/2 watt. Higher wattage rated resistors when specified are progressively larger in physical size. Small wire wound resistors 1/2 watt, 1 or 2 watt may be color coded but the first band will be double width.

MOLDED MICA TYPE CAPACITORS

CURRENT STANDARD CODE 	RMA 3-DOT (OBSOLETE) RATED 500 W.V.D.C. ± 20% TOL. 	BUTTON SILVER MICA CAPACITOR
RMA (5-DOT OBSOLETE CODE) 	RMA 6-DOT (OBSOLETE) 	RMA 4-DOT (OBSOLETE)

MOLDED PAPER TYPE CAPACITORS

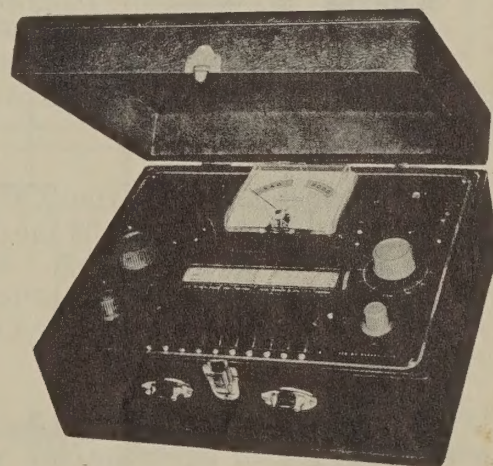
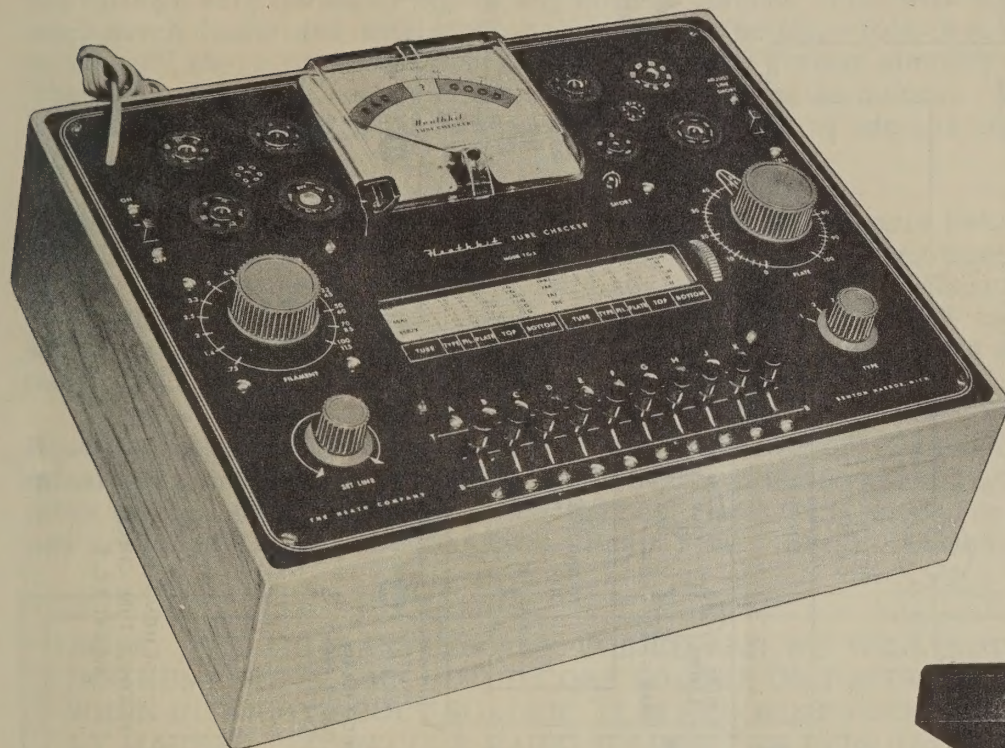
TUBULAR CAPACITOR Normally stamped for value A 2 digit voltage rating indicates more than 900 V. Add 2 zeros to end of 2 digit number.	MOLDED FLAT CAPACITOR Commercial Code 	JAN. CODE CAPACITOR
---	---	--------------------------------

The tolerance rating of capacitors is determined by the color code. For example: red = 2%, green = 5%, etc. The voltage rating of capacitors is obtained by multiplying the color value by 100. For example: orange = 3 × 100 or 300 volts. Blue = 6 × 100 or 600 volts.

In the design of Heathkits, the temperature coefficient of ceramic or mica capacitors is not generally a critical factor and therefore Heathkit manuals avoid reference to temperature coefficient specifications.

ASSEMBLY AND OPERATION OF THE HEATHKIT TUBE CHECKER

MODEL TC-2



SPECIFICATIONS

Simplified set-up procedure.

Rapid switch selection of individual tube elements.

Any combination of base pin connections.

Check for quality, emission, shorted elements, open elements, and filament continuity.

Checks 4, 5, 6, and 7 pin large, regular and miniature, octal, loctal, Hytron, 9 pin miniature and pilot lamps.

Individual tests on multiple element tubes.

Blank panel socket for obsolescence protection.

Compensation for line voltage variation.

New smooth rolling illuminated roll chart.

Easy to read GOOD-BAD meter scale.

Fourteen Filament voltages - .75 to 117 volts

Element Test Voltages.....0-250 volts

Dimensions.....14" wide x 11" deep x 4 1/4" high

Power Requirements..... 105-125 volts 50/60 cycles AC

NOTES ON ASSEMBLY AND WIRING

The Heathkit model TC-2 Tube Checker, when properly constructed will provide a service type instrument capable of many years of satisfactory operation. We urge you to take the necessary time to assemble and wire the instrument carefully. Do not hurry the work and you will be rewarded with a greater sense of confidence both in the equipment and your own workmanship.

This manual is supplied to assist you in every way to complete the instrument with the least possible chance of error. We suggest that you take a few minutes now and read the entire manual through very carefully before any work is started. This will enable you to proceed with the work much faster and with greater accuracy. The large fold-in pictorials are handy to attach to the wall above your work space. Their use will greatly simplify the construction of the kit. These diagrams are repeated in smaller form within the manual. We suggest that you retain the manual in your files for future reference, both in the use and maintenance of the TC-2 Tube Checker.

Unpack the kit carefully and check each part against the parts list. By so doing, you will become acquainted with each part. Refer to the charts and other information shown on the inside covers of the manual to help you identify any parts about which there may be a question. If some shortage is found in checking the parts, please notify us promptly and return the inspection slip with your letter to us. Hardware items are counted by weight, and if a few are missing, please obtain them locally if at all possible.

Read the note on soldering on the inside of the back cover. Crimp all leads tightly to each terminal before soldering. Be sure both the lead and the terminal are clean of wax, corrosion or other foreign substances. Use only the best rosin core solder, preferably one containing the new activated fluxes, such as Kester "Resin Five," Ersin "Multicore," or similar types.

NOTE: ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE INSTRUMENTS IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. WHEN IN DOUBT ABOUT SOLDER, IT IS RECOMMENDED THAT A NEW ROLL PLAINLY MARKED "ROSIN CORE RADIO SOLDER" BE PURCHASED.

Resistors and controls generally have a tolerance rating of $\pm 20\%$ unless otherwise stated in the parts list. Therefore a 100 K Ω resistor may test anywhere from 80 K Ω to 120 K Ω . (The letter K is commonly used to designate a multiplier of one thousand.) Tolerances on condensers are generally even greater. Limits of $+100\%$ and -50% are common for electrolytic condensers. The parts furnished with your Heathkit have been specified so as not to adversely affect the operation of the finished instrument.

In order to expedite delivery to you, we are occasionally forced to make minor substitutions of parts. Such substitutions are carefully checked before they are approved to insure that the parts supplied will work satisfactorily. By checking the parts list for resistors, for example, you may find that a 2.2 megohm resistor has been supplied in place of a 2 megohm as shown in the parts list. These changes are self-evident and are mentioned here only to prevent confusion to you in checking the contents of your kit.

We strongly urge that you follow the wiring and parts layout shown in this manual. The desirable position of wires and parts has been previously determined for arrangement in logical sequence. Any changes may seriously affect the characteristics of the circuit or the operation of the completed instrument.

INSTRUMENT DESCRIPTION

The Heathkit model TC-2 Tube Checker was expressly designed for checking tubes encountered in everyday radio and TV service work. It is capable of providing an overall quality test, will indicate shorted elements, open elements and filament continuity. It will check 4, 5, 6, and 7 pin, large, regular and miniature, octal, loctal, Hytron, 9 pin miniature series tubes and pilot lamps. Separate tests for the oscillator section of converter tubes have been provided. A blank socket is arranged on the panel to facilitate modification for checking newly added tube types as protection against obsolescence.

The roll chart contains all necessary data for the checking of currently used tubes. Because of the constantly growing list of tubes, it was decided to eliminate tubes classified as seldom-used, or obsolete, in an effort to hold down the physical length of the roll chart. The information for various settings of the tubes in this particular classification is supplied on a separate sheet. The Heath Company periodically revises the roll chart in order to provide the latest test information. Announcement of new chart availability is usually made in Heathkit Flyer advertising and replacement charts can be obtained for a nominal charge of fifty cents (\$0.50).

One secondary winding of the power transformer is tapped for fourteen different filament voltages which range from .75 volts up to 110 volts. Such an arrangement assures placing the proper filament voltages on the hundreds of tubes listed on the chart and the filament switch makes proper connections.

The other secondary winding has voltage taps of 30 volts, 100 volts and 250 volts, and the various tests use these different voltages. Three basic circuits are set up as the tube is checked and these operate in the following manner.

The first basic circuit is used when making the quality and open checks. In these tests, 30 volts AC are placed across the tube between filament and plate and the tube under test conducts as a half-wave rectifier. The filament and cathode are connected together as are the plate and the grids. The PLATE adjust control adjusts the sensitivity of the BAD-GOOD meter, which is in the circuit at this time. The roll chart gives the setting for PLATE adjust control and a good tube with the sensitivity of the meter properly set will have sufficient cathode emission to swing the meter needle to the GOOD position. If the tube emission is too low, the conducting current of the tube will not be high enough to bring the needle into the GOOD section, rather into the ? or BAD section. Thus the cathode emission is checked.

Basically, the open check works as follows. The plate and all grids connected together will receive a certain amount of electrons from the cathode. The meter reading with this flow is noted. Then, to test each element individually for opens, each of the grids is in turn disconnected and if the element is not open, the current through the meter drops and the reading is less than originally noted. If an element is open, it is recognized because the meter reading does not drop when this element is checked. For tubes with quite a number of grids, the operation is somewhat more complex, but the same theory applies in general. For gas tubes, (OZ4, etc.) the 250 volt tap rather than the 30 volt tap is used. The circuitry remains unchanged.

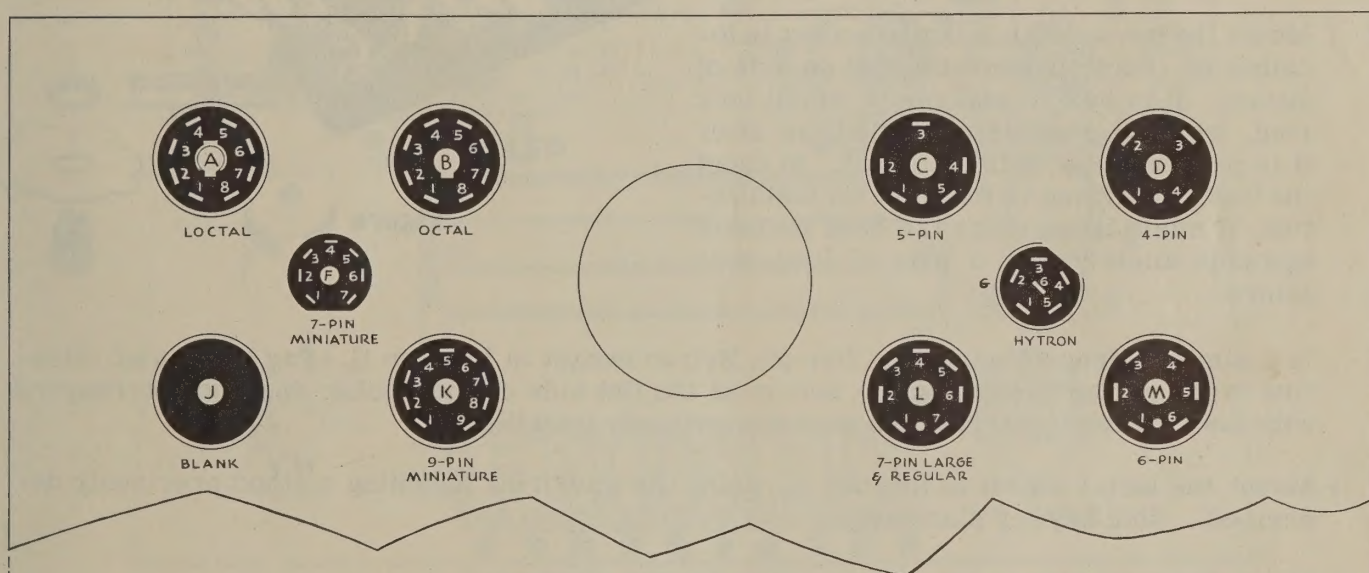
The second basic circuit is used in short and filament continuity test. The 100 volt tap is connected to the neon bulb short indicator and associated network, and is in series with the plate of the tube being tested. The meter is not now in the circuit and the checks are indicated by the neon bulb. Putting the switches in the positions as indicated on the roll chart, connect the various tube elements in such a manner that a shorted element will cause considerable increased current flow through the resistor in parallel with the neon bulb. The voltage drop then produced reaches the operating voltage of the neon bulb, and it glows brightly indicating a short. For the filament tap continuity test, the filament setting is reduced to .75 volts and with continuity the neon bulb will glow.

The third basic circuit is in the SET LINE position. The SET LINE control in the primary of the power transformer, varies the voltage across the primary thereby in turn the secondary voltage. The meter with the voltage divider network and the rectifier now in the circuit will indicate the proper secondary voltage when the needle is set on the SET LINE marking. The purpose of the SET LINE is to assure proper voltages on the tube under test, rather than have false indication as a result of high or low power line voltages.

NOTE: In some sections of the country where AC line supply voltages are somewhat higher than the average, it may be necessary to further compensate for increased voltage by installing a resistor in series with one leg of the transformer primary winding. The exact resistance value required can best be determined experimentally, but it will generally fall between 50 and 100 ohms. Due to the power requirements of the Tube Checker it would be advisable that the resistor have a rating of at least 20 watts and should preferably be of the wire-wound type.

MECHANICAL ASSEMBLY

Study Pictorial 1 very carefully, and note the placement of various parts. This pictorial shows the aluminum panel as viewed from the rear. Throughout this manual, a system of alphabetical



Pictorial 1
Panel Viewed from Rear

designation will be used for each part, and each terminal connection of the part will be assigned a number. Therefore, the first tube socket in the upper left corner, which is a loctal socket, is designated as A, and the eight pins will be identified as A1, A2, A3, etc. Actually marking the panel openings will prove helpful. This same procedure will be used throughout instrument construction. Please note also that some parts such as the lever switches, have been assigned a dual alphabetical designation, such as EE, FF, GG, etc.

Actual assembly will first begin with the mounting of the ten tube sockets. These sockets are of rugged construction and will provide good service under the strain to which they are subjected through the constant insertion and removal of tubes during test procedure. All of these sockets are of ring mounting type for additional strength. When installing these sockets with the ring mounting be sure to make the installation properly so that no difficulty with socket loosening will occur later on after all of the wiring has been installed. When installing sockets be sure to note the keyway designation or the relative locations of the socket pins as shown in Pictorial 1. You will note that in most instances, each pin of the socket has a molded number for quick identification.

An additional wavy ring and lock ring have been provided for your convenience in event a ring should become damaged during construction. Please note that one of the wavy rings is much larger, and this ring should be used only on socket L, which is the large seven-pin socket having the pilot light test socket incorporated in its design.

To prevent marring the finish of the Tube Checker panel, it is advisable to place a pad or cloth over the workbench or working surface for protective purposes. Sockets are held in place by a wavy ring which is forced over the back of the socket and into the grooves along the edge as shown in Figure 1.

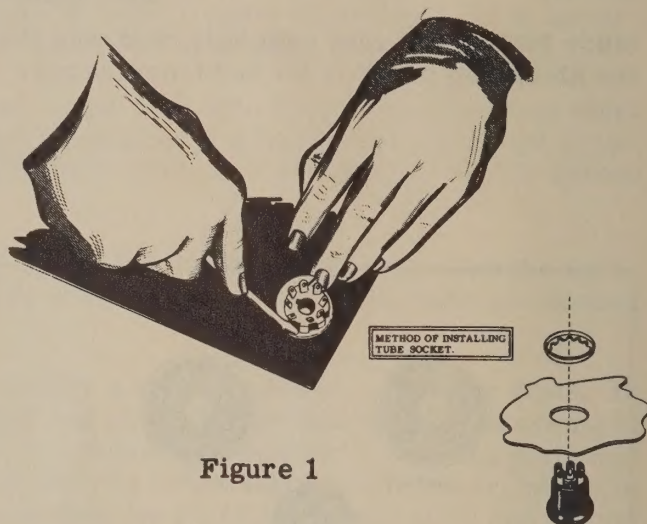
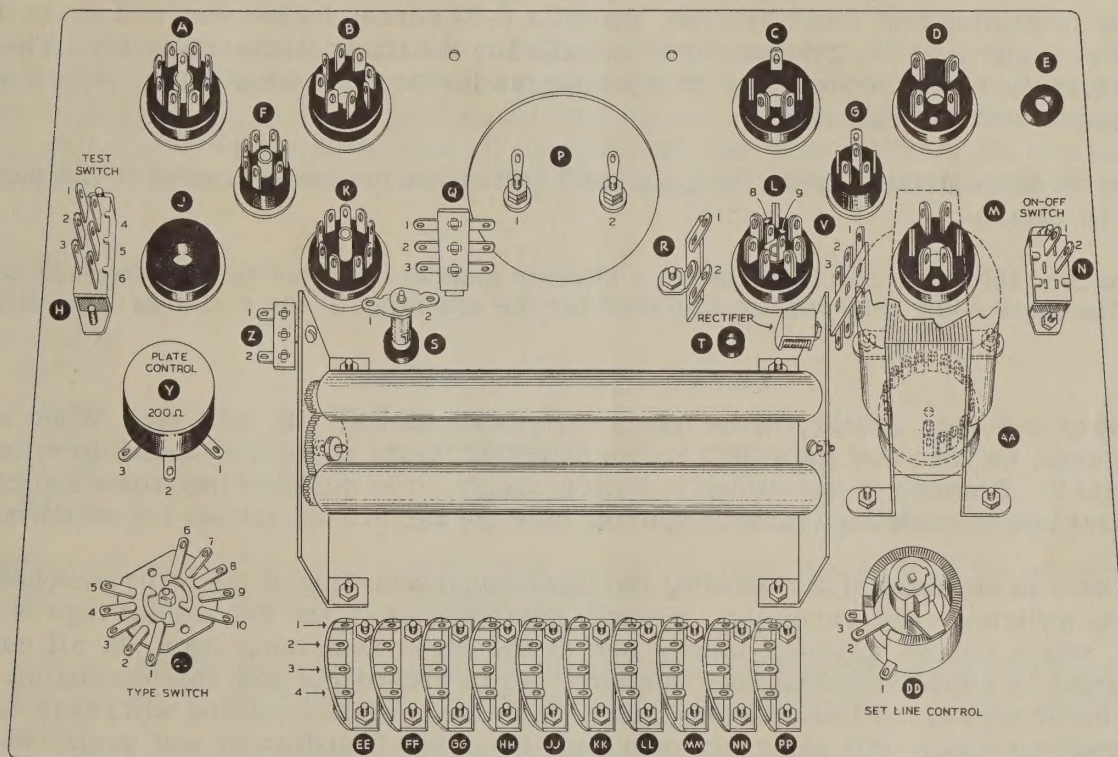


Figure 1

- () Mount the seven pin miniature socket in location F. Note placement of flat on side of socket. It is held in place by a small lock ring, which is pressed over the base after it is properly placed in the panel. In event the lock ring fitting is too tight for installation, it might be necessary to bend the teeth upwards slightly with a pair of long-nose pliers.
- () In a similar manner, mount the five pin Hytron socket in location G. Pay particular attention to the pin numbering on the socket as the flat side of the socket does not correspond with the relative location of the socket previously installed.
- () Mount the octal socket in location A, using the wavy ring mounting method previously described. Note keyway placement.
- () Mount the octal ring in location B. Note keyway placement.
- () Mount the five pin socket in location C.
- () Mount the four pin socket in location D.
- () Mount the blank socket in location J.
- () Mount the nine pin miniature socket in location K. Note that the blank space in the socket, pin ring is placed toward the bottom of the panel.
- () Mount the large seven pin socket in location L. This socket uses the largest of the wavy rings supplied.
- () Mount the six pin socket in location M.

- () Using 6-32 screws, lockwashers and nuts, mount the OFF-ON switch in location N. Use care to see that the lugs are positioned exactly as shown in Pictorial 2.
- () Mount the double pole double throw spring return slide switch in location H. When mounting this switch, orient it so that the slide button is normally in the ADJUST LINE SHORT (see front of panel) position. Use 6-32 screws. No lockwashers or nuts are needed as switch frame is tapped and threaded.
- () Mount the 200 Ω control in location Y by means of a control lockwasher, control panel washer and nut.
- () Mount the 14 position rotary switch in location AA with a control lockwasher, control panel washer and nut.



PARTS PLACEMENT AND TERMINAL IDENTIFICATION.

Pictorial 2

HEATHKIT TUBE CHECKER
MODEL TC-2

- () Mount the two pole four position rotary switch in location CC. Use a control lockwasher, control panel washer and nut. Before tightening the nut, note the flat on the switch shaft and orient the flat so that it is on the side of the shaft opposite the panel designation type 1. This should be done with the switch indexed maximum counter-clockwise. This precaution is observed so that the switch will not be mounted upside down.
- () Mount the 200 Ω 25 watt control in location DD. Use one nut below the panel when mounting the control, as the locating pin on the control is not used and its thickness must be accounted for. Use a control lockwasher, control panel washer and nut in the same manner as when the other controls were mounted.
- () Slide the 5/16" rubber grommet in the hole in location T.

- () Slide the 1/2" rubber grommet in location S.
- () Slide a 3/8" rubber grommet in location E.
- () In order to protect the meter face, the meter will not be installed at this time. Since the meter mounting screws are used to mount a two lug and a three lug terminal strip, these terminal strips will be mounted with 6-32 screws and nuts temporarily. These screws and nuts will then be removed later on when the actual installation of the meter is called for.
- () Mount a three lug vertical terminal strip in location Q.
- () In a like manner, mount a two lug terminal strip in location R.
- () Observe Pictorial 2 and mount the two lug terminal strip Z on a roll chart bracket. Mount the gear shaft on the same bracket using a #6 lockwasher and a 6-32 nut.
- () On the remaining tube chart bracket, install a 6-32 screw, lockwasher and nut in the same relative position as the gear shaft was installed on the first roll chart bracket. The purpose of this screw is to provide a slip on mounting pin for the panel lamp holder, which will later be slipped over both brackets.
- () Place the large drive gear on the gear shaft and fasten the angle bracket to the panel using 6-32 hardware.
- () Mount the other roll chart bracket in a similar manner. Do not tighten the 6-32 screws at this time, as some play will be required for the mounting of the roll chart in a later step.

LEVER SWITCH MOUNTING

The ten lever switches should now be mounted in locations EE, FF, GG, etc. When mounting these switches, be sure that the switch frame mounting flange is pointing in the direction shown in Pictorial 2. Because of variations in switch supply, it is possible that some switches may already have tapped mounting frames requiring only the use of 6-32 screws for switch mounting.

In event there is any confusion regarding the mechanical mounting of the lever switches, please inspect the switches very carefully. You will note that one of the four solder lugs is a "common" lug, which can be switched to any one of the three remaining lugs. In all cases, the switch should be mounted so that the "common" lug is toward the roll chart mounting or away from the lower edge of the Tube Checker panel. Reversed switch mounting will result in a short circuit condition which will seriously overload the power transformer and could conceivably cause transformer failure. The importance of correct switch mounting cannot be over-emphasized.

NOTE: In all future correspondence, please be sure to properly identify the particular lever switches used in your kit. They may be any one of the following three major types:

1. JBT; identified by initials JBT on arm assembly, leaf spring detent action and numbered designation SS 141L3.
 2. CENTRALAB; identified by frame designation CRL 10938 and coil spring detent action.
 3. GRIGSBY-ALLISON; identified by frame designation G-A 5263 and leaf spring detent action.
- () Install all ten lever switches in an identical manner with the "common" lug of each switch toward the roll chart assembly. For installation ease start with switch EE and work towards the right.

The preliminary mechanical assembly of the Tube Checker has now been completed with the exception of the installation of the meter, power transformer, and a few other miscellaneous items which will be installed in later steps. The instrument is now ready for basic switch and tube socket wiring. However, before proceeding with the wiring, carefully recheck all assembly up to this point. In event any errors are present, it is much easier to correct them now rather than after all of the wiring is in place.

SWITCH AND SOCKET WIRING

In order to simplify the detailed but very important wiring between the tube sockets and the lever switches, color coded wire will be used. A four foot length of 8-wire color coded cable has been furnished with this kit. Two lengths of this cable will be required for two separate wiring harnesses. Therefore, measure and cut off a 15" length of 8-wire cable and a 12" length of 8-wire cable. The remaining length of wire cable should now be pulled apart in order to use the individual sections of colored wire. This can be accomplished by cutting a portion of the outer plastic insulation and then removing the wires by pulling them out of the cable one at a time. Do not separate the 15" and 12" lengths of cable previously cut.

To further standardize wiring procedure, the color code used in resistance work will be used as much as possible with the exception of the black and white cable wires. In actual wiring procedure calling for the wiring of pin 1 on all sockets and connecting to the corresponding lever switch the same color wire will be used all the way from the lever switch to pin 1 on all sockets. In this instance, the color of the wire will be brown. For convenience the following code will be used.

1. Brown
2. Red
3. Orange
4. Yellow
5. Green
6. Blue
7. Black
8. White

By installing all wiring using this color code, it will be much easier to trace out all wiring in event trouble shooting should be required at any time.

The 12" and 15" lengths of 8-wire cable will be prepared as separate wiring harnesses before actual installation. If the following instructions are carefully followed, a neat compact wiring job will result.

CABLE HARNESS PREPARATION

The 15" length of 8-wire cable will be installed first. This should be prepared by removing 5" of outer covering from one end and 3" of outer covering from the other end of the cable. This can be easily accomplished by bending the wire cable at the point where a circular cut will be made through the outer insulation. Use a sharp knife or a razor blade and cut the insulation covering very carefully so as to not damage the insulation on the wires underneath the outer covering. Rotate the cable during the cutting procedure and a very neat job can be obtained. After the circular cut is made, the outer covering can be easily slipped off the cable end without disturbing the wires. Prepare both ends of the 15" cable length in this manner.

Starting with the end of the cable from which the 5" length of insulation was removed, the following wires should be cut to length. Do not cut the brown, red, and orange wires.

- () Cut off a 1 1/2" length of the yellow wire.
- () Cut off a 1" length of green wire.
- () Cut off a 1 1/2" length of blue wire.

() Cut off a 1 1/2" length of black wire.

() Cut off a 1 1/2" length of white wire.

The remaining lengths of wire at the 5" end of the cable should now be prepared for soldering by removing 1/4" of insulation from the end of each wire. Twist the loose strands together and tin each wire end by using a hot soldering iron being careful not to burn or damage the plastic covering.

Prepare the other end of the 15" cable harness by cutting the following wires.

() Cut off 2" of the brown wire.

() Cut off 2" of the red wire.

() Cut off 2" of the orange wire.

() Cut off 1" of the yellow wire.

() Cut off 1" of the white wire.

NOTE: The blue and black wires are not cut as the full length will be used.

Prepare this end of the harness by removing 1/4" of the insulation from the end of each wire. Twist the loose strands together and tin the wire by using a hot iron and permitting solder to flow through the strands to form a compact wire end without allowing any excess solder blobs to remain on the wire.

(S) means solder.

(NS) means do not solder yet.

() Connect a length of hookup wire to lever switch EE1 (S).

() Dress this wire around the roll chart bracket and across the panel to R1 (NS).

() Connect a length of hookup wire to lever switch FF1 (S).

() Dress the wire around the roll chart bracket to K9 (S).

() The end of the cable harness from which the 5" length of insulation was removed will now be installed to the lever switches starting by connecting the brown wire to PP1 (S).

() Connect the red wire to NN1 (S).

() Connect the orange wire to MM1 (S).

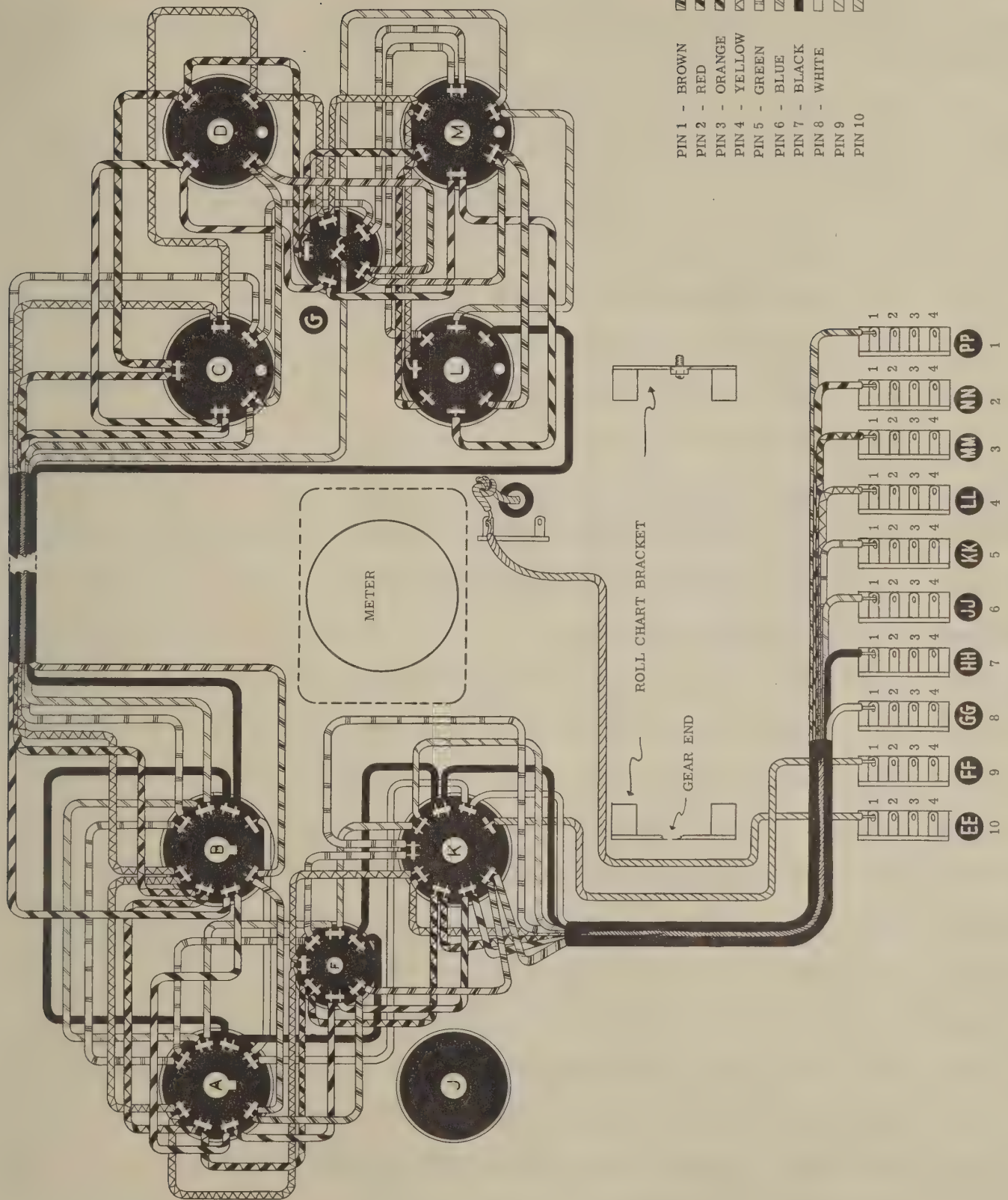
() Connect the yellow wire to LL1 (S):

() Connect the green wire to KK1 (S).

() Connect the blue wire to JJ1 (S).

() Connect the black wire to HH1 (S).

() Connect the white wire to GG1 (S).



Pictorial 3
Harness Wiring

Subsequent wiring steps will require the use of the various lengths of assorted colored wire previously separated. In each instance, the length of wire should be roughly determined and will usually be between 2" or 3" long. The insulation should be stripped 1/4" from each end of the wire, the wire twisted, and tinned in the same manner called for in the preparation of the harness.

- () The 15" cable harness should now be dressed around the roll chart bracket to socket K and wiring will continue by connecting the brown cable wire to K1 (NS).
- () Connect a short length of brown wire from K1 (S) to F1 (NS).
- () Connect a short length of brown wire from F1 (S) to A1 (NS).
- () Connect a short length of brown wire from A1 (S) to B1 (NS).
- () Connect the red cable wire to K2 (NS).
- () Connect a short length of red wire from K2 (S) to F2 (NS).
- () Connect a short length of red wire from F2 (S) to A2 (NS).
- () Connect a short length of red wire from A2 (S) to B2 (NS).
- () Connect the orange cable wire to K3 (NS).
- () Connect a short length of orange wire from K3 (S) to F3 (NS).
- () Connect a short length of orange wire from F3 (S) to A3 (NS).
- () Connect a short length of orange wire from A3 (S) to B3 (NS).
- () Connect the yellow cable wire to K4 (NS).
- () Connect a short length of yellow wire from K4 (S) to F4 (NS).
- () Connect a short length of yellow wire from F4 (S) to A4 (NS).
- () Connect a short length of yellow wire from A4 (S) to B4 (NS).
- () Connect the green cable wire to K5 (NS).
- () Connect a short length of green wire from K5 (S) to F5 (NS).
- () Connect a short length of green wire from F5 (S) to A5 (NS).
- () Connect a short length of green wire from A5 (S) to B5 (NS).
- () Connect the blue cable wire to K6 (NS).
- () Connect a short length of blue wire from K6 (S) to F6 (NS).
- () Connect a short length of blue wire from F6 (S) to A6 (NS).
- () Connect a short length of blue wire from A6 (S) to B6 (NS).
- () Connect a black cable wire to K7 (NS).
- () Connect a short length of black wire from K7 (S) to F7 (NS).

- () Connect a short length of black wire from F7 (S) to A7 (NS).
- () Connect a short length of black wire from A7 (S) to B7 (NS).
- () Connect the white cable wire to K8 (NS).
- () Connect a short length of white wire from K8 (S) to A8 (NS).
- () Connect a short length of white wire from A8 (S) to B8 (S).

Prepare the remaining 12" length of 8-wire cable in a similar manner by removing 2 1/2" of outer covering from one end and 4 1/2" of outer covering from the other end. This length of 8-wire cable will be used in making connections from socket B to the group of tube sockets on the other side of the panel. Since the number 8 white wire will not be used it can either be ignored or pulled out of the cable assembly. Before installing the cable harness, the ends should be cut and tinned in the same manner as the 15" length of wire previously installed.

- () Starting with the cable length from which 2 1/2" of insulation or outer covering have been removed, cut off 1" of yellow wire.
- () Cut off 1" of the green wire.
- () Cut off 1" of the blue wire.
- () Cut off 1" of the black wire.

1/4" of insulation should be removed from each end of the wires, the loose strands twisted tightly together, and the wire carefully tinned.

- () Going to the other end of the wire harness, cut off 3" of the brown wire.
- () Cut off 3" of the red wire.
- () Cut off 3" of the orange wire.
- () Cut off 2" of the yellow wire.
- () Cut off 1" of the green wire.
- () Cut off 1" of the blue wire.

DO NOT cut the black wire.

Again the insulation should be removed from the wire ends, the loose strands tightly twisted and carefully tinned.

- () Starting with the end of the cable from which 2 1/2" of insulation have been removed, connect the brown cable wire to B1 (S).
- () Connect the red cable wire to B2 (S).
- () Connect the orange cable wire to B3 (S).
- () Connect the yellow cable wire to B4 (S).
- () Connect the green cable wire to B5 (S).
- () Connect the blue cable wire to B6 (S).

() Connect the black cable wire to B7 (S).

NOTE: There is no connection to B8 as far as this particular cable installation is concerned.

() Dress the harness across the top of the panel to socket C and connect the brown cable wire to C1 (NS).

() Connect a short length of brown wire from C1 (S) to D1 (NS).

() Connect a short length of brown wire from D1 (S) to G1 (NS).

() Connect a short length of brown wire from G1 (S) to M1 (NS).

() Connect a short length of brown wire from M1 (S) to L1 (S).

() Connect the red cable wire to C2 (NS).

() Connect a short length of red wire from C2 (S) to D2 (NS).

() Connect a short length of red wire from D2 (S) to G2 (NS).

() Connect a short length of red wire from G2 (S) to M2 (NS).

() Connect a short length of red wire from M2 (S) to L2 (S).

() Connect the orange cable wire to C3 (NS).

() Connect a short length of orange cable wire from C3 (S) to D3 (NS).

() Connect a short length of orange wire from D3 (S) to G3 (NS).

() Connect a short length of orange wire from G3 (S) to M3 (NS).

() Connect a short length of orange wire from M3 (S) to L3 (S).

() Connect the yellow cable wire to C4 (NS).

() Connect a short length of yellow wire from C4 (S) to D4 (NS).

() Connect a short length of yellow wire from D4 (S) to G4 (NS).

() Connect a short length of yellow wire from G4 (S) to M4 (NS).

() Connect a short length of yellow wire from M4 (S) to L4 (S).

() Connect the green cable wire to C5 (NS).

() Connect a short length of green wire from C5 (S) to G5 (NS).

() Connect a short length of green wire from G5 (S) to M5 (NS).

() Connect a short length of green wire from M5 (S) to L5 (S).

() Connect the blue cable wire to G6 (NS). (G6 is the center terminal of the Hytron socket.)

() Connect a short length of blue wire from G6 (S) to M6 (NS).

() Connect a short length of blue wire from M6 (S) to L6 (S).

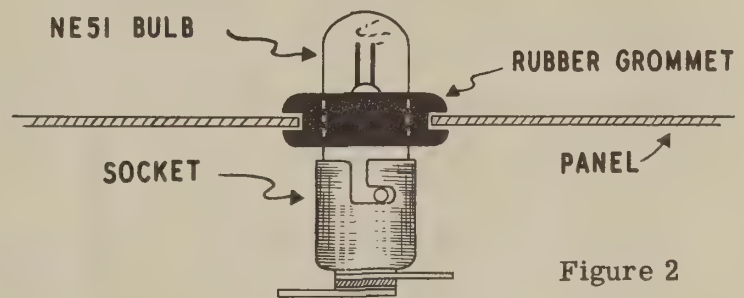
- () Connect the black cable wire to L7 (S).

You have now completed all of the wiring between the tube sockets and lever switches which will permit individual switch selection of any tube element. This represents the major portion of the Tube Checker instrument wiring and it is very important that all of the wiring be correctly done. May we suggest that at this time you recheck all connections to the various tube socket terminals to make sure that no loose strands of wire, cuttings, or blobs of solder can cause a short circuit. Dress all the wiring neatly away from each socket terminal and press the wiring down toward the panel.

To carry the test further, the use of an ohmmeter between terminal 1 of each lever switch and the corresponding socket terminals will indicate proper continuity. In a similar manner, short circuits between lever switch terminals, socket terminals, or even grounding to the panel can be detected. The importance of correctly installing this wiring cannot be over-emphasized.

FINAL ASSEMBLY AND WIRING

- () Referring to Pictorial 2 mount the meter rectifier and the 3 lug vertical terminal strip in the position shown on the roll chart bracket. (Straighten the L-shaped terminal mounting to permit vertical placement.)
- () Place the neon bulb in the bayonet socket and slide the bulb into grommet S. See Figure 2.
- () Run a wire from S1 (S) to Q1 (S).
- () Connect a 270 K Ω resistor (red-purple-yellow) between Q2 (S) and Q3 (NS).
- () Run a wire from S2 (S) to Q2 (NS).
- () Connect a 100 K Ω resistor (brown-black-yellow) from Q1 (S) to Q3 (NS).
- () Referring again to the ten lever switches, bend lugs 2, 3, and 4 slightly upward on all ten switches.
- () Dress a length of bare wire through all terminal 2 switch lugs.
- () Dress a similar length of bare wire through all terminal 3 switch lugs.
- () Dress a third length of bare wire through all terminal 4 switch lugs.
- () Carefully solder all terminal connections with the exception of connections on switches EE2, EE4 and PP2, PP3. These terminals are not soldered at this time as additional connections will be made to these switch solder lugs. When soldering the terminals, be sure to use a hot iron and flow the solder smoothly into each joint. so that a good electrical bond exists. Avoid excessive use of solder which could conceivably cause a switch flooding condition.
- () Refer to Pictorial 2 for placement of switch H.
- () Run a wire from H1 (S) to Q2 (S).
- () Run a wire from H2 (S) to switch CC1 (S).
- () Run a wire from H4 (S) to EE4 (S).
- () Run a wire from H5 (S) to V2 (NS).



- () Run a wire from H6 (S) to CC10 (NS).
- () Run a wire from plate control Y3 (S) to EE2 (S).
- () Connect a 360 Ω 5% resistor (orange-blue-brown) from CC10 (NS) to CC9 (S).
- () Connect one lead of a 1500 Ω 5% resistor (brown-green-red) to CC10 (S), and pass the other lead of the resistor through CC8 (S) and continue to CC7 (S).
- () Connect an 820 Ω 5% resistor (gray-red-brown) between CC3 (NS) and CC4 (S).
- () Connect a 3600 Ω 5% resistor (orange-blue-red) between CC3(NS) and CC5 (S).
- () Moving to socket L, connect a length of hookup wire from L8 (S) to PP3 (NS). Dress this wire around the end of the tube bracket and close to the panel.
- () Connect another wire from L9 (S) to PP2 (NS) dressing the wire in a similar manner. Avoid excessive use of solder when connecting to L8 and L9 to prevent shorting at the terminal base.
- () Connect a wire from the filament selector switch AA15 (S) to PP3 (S).
- () Install the 75 K Ω precision resistor from AA1 (NS) to V1 (NS). Dress this resistor placement down near the panel so it will not interfere with wiring to be connected to the filament selector switch terminals. (Use sleeving.)
- () Connect the yellow lead of the meter rectifier to V2 (S).
- () Connect the red lead of the meter rectifier to V1 (NS).
- () Connect a 1200 Ω resistor (brown-red-red) from V1 (S) to V3 (NS).
- () Connect a 6" length of hookup wire to AA8 (NS). The other end of this hookup wire will be connected to the panel light assembly in a later step.

At this stage of assembly, the roll chart should be mounted in the following manner. Place brass washers on the two wood roller spindle ends opposite the gear end. Loosen the chart very slightly and install face down with the printed surface against the panel opening. Be sure to first slip the chart under the hub of the drive gear. The two spindle ends on which the brass washers were previously installed should now be slipped into place in the roll chart bracket. The gear end of the wood rollers should now be slipped into place on the other roll chart mounting bracket, being certain that the gears properly mesh.

The mounting of the angle bracket assembly to panel should now be checked before the mounting screws are tightened. You will note that the openings in the roll chart angle bracket mounting flanges are elongated to permit some range of adjustment. The purpose of this adjustment range is to prevent undue lateral motion of the roll chart assembly.

The roll chart should roll smoothly and freely from one end of its length of travel to the other without diagonal running or binding. If the chart is loose on the roller, there will be too much play in the action. If too tight, the chart will bind, usually at either end of its travel.

Adjust angle bracket mounting so that thumbwheel drive does not bind. Roller spindles may be lightly lubricated with fine oil.

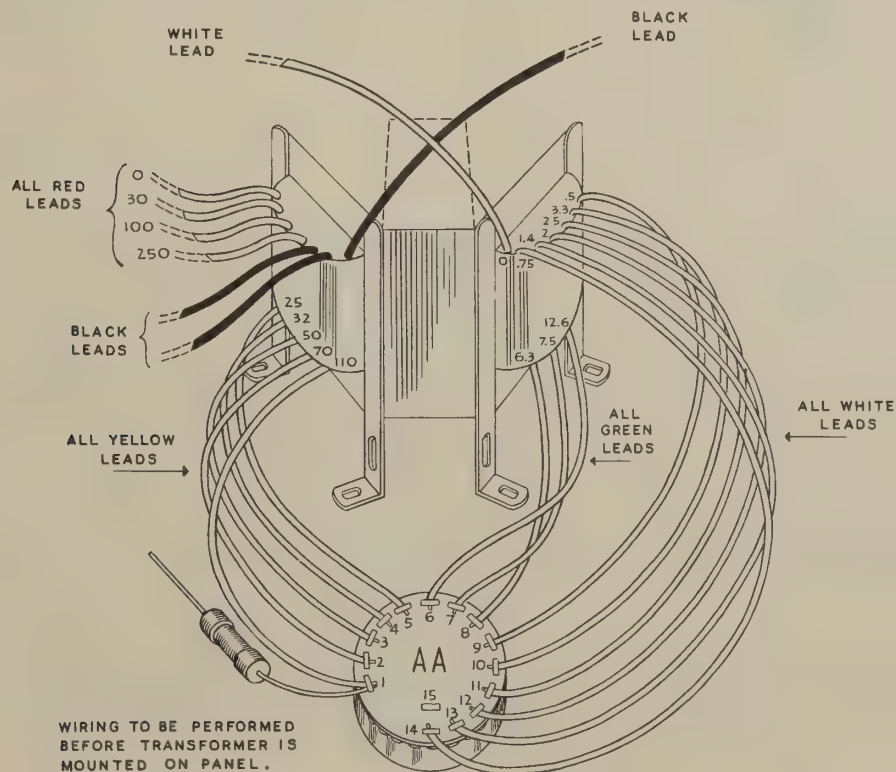
PANEL LAMP BRACKET

- () Install two 1/2" rubber grommets in the panel lamp bracket.
- () Install two #47 pilot lamps in their respective bayonet bases.
- () Moisten the glass surface of the panel lamps for easy installation. Push them through the rubber grommets until the bayonet pin portion of the lamp and socket engage the grommet.
- () Turn the panel lamp sockets so that the solder lugs are parallel to each other and connect short lengths of hookup wire between terminals 1 (S) of each socket and terminals 2 (S) of each socket. The pilot light bracket can now be installed by slipping the 5-32 mounting hole in one bracket end over the roll chart bracket opposite the bracket with the gear mounting. The bracket mounting hole should be slipped over the end of the 6-32 screw and nut previously installed in the same relative location as the gear shaft mounting on the other bracket. The remaining end of the pilot light bracket should be slipped over the 6-32 stud mounting for the main drive gear.

Please note that the free mounting of the pilot light bracket is deliberate. The bracket should not be bolted or fastened to either of the studs and is held in place by the slip-on method of installation. As the roll chart is rotated from one end of its travel to the other, the pilot lamp bracket will rock slightly and act as a chart guide. It might be necessary to adjust the mounting tension of the panel lamp bracket and this can be accomplished by slight bending of the end pieces.

- () Connect the free end of the short length of hookup wire previously installed to AA8 to one of the pilot light socket terminals (S).
- () From the other pilot light socket terminal, connect a short length of hookup wire to PP2 (NS). Refer to Pictorial 5.

POWER TRANSFORMER MOUNTING AND WIRING



Pictorial 4

Expanded View of Power Transformer Wiring

The power transformer should be inspected, and you will note that the leads are color coded as well as marked on the paper wrapper around the windings. Straighten the leads and identify each lead. During this process handle the transformer leads with care. Although they are firmly anchored, it would be wise to avoid unnecessary difficulty that might be caused through undue tension on the leads. If an ohmmeter is available, it would be advisable to check transformer continuity at this time. The power transformer is partially wired into the circuit before it is mounted. Follow Pictorial 4 carefully and do not cut the leads. They are of the proper length to be easily connected into the circuit.

- () Connect the yellow 110 volt lead to AA1 (S).
- () Connect the yellow 70 volt lead to AA2 (S).
- () Connect the yellow 50 volt lead to AA3 (S).
- () Connect the yellow 32 volt lead to AA4 (S).
- () Connect the yellow 25 volt lead to AA5 (S).
- () Connect the green 12.6 volt lead to AA6 (S).
- () Connect the green 7.5 volt lead to AA7 (S).
- () Connect the green 6.3 volt lead to AA8 (S).
- () Connect the white 5 volt lead to AA9 (S).
- () Connect the white 3.3 volt lead to AA10 (S).
- () Connect the white 2.5 volt lead to AA11 (S).
- () Connect the white 2 volt lead to AA12 (S).
- () Connect the white 1.4 volt lead to AA13 (S).
- () Connect the white .75 volt lead to AA14 (S).

The white 0 volt lead is left unconnected at this time.

The power transformer should now be mounted above switch AA. In mounting each of the power transformer flanges, slide a 6-32 screw through the proper hole in the panel, set the transformer flange over the screw, slip a plain washer and a lockwasher over the screw and fasten with a 6-32 nut. Repeat this procedure for the other three flanges. Before tightening the screws, stand the Tube Checker panel on its end so that the weight of the transformer will allow the slotted flanges to slide away from the roll chart bracket assembly. This is done to provide as much clearance as possible between the pilot lamp bracket and the transformer winding. Firmly tighten the 6-32 screws and nuts.

NOTE: If necessary the transformer mounting legs can be bent slightly in order to increase the clearance between the transformer and pilot bracket.

Before proceeding further, check all wiring in the vicinity of the transformer mounting. Make sure that the wiring has not been pinched between the panel and transformer mounting flanges. Dress excess transformer lead wiring underneath the power transformer so that it will not interfere with the necessary clearance required for mounting the panel to the Tube Checker cabinet.

- () Connect the red 0 volt power transformer lead to Y1 (NS).
- () Run a wire from Y1 (S) to CC6 (S).
- () Connect a red 30 volt power transformer lead to CC3 (S).
- () Connect the red 100 volt lead to R2 (NS). (The red 250 volt lead is left unconnected at this time.)
- () Mount the .1 μ fd condenser between R2 (S) and Q3 (S).
- () Connect the black 0 volt transformer lead to N2 (S).
- () Connect the black 100 volt transformer lead to DD3 (S).
- () Connect the black 125 volt power transformer lead to DD1 (S).
- () Connect the white 0 volt transformer lead to PP2 (S).
- () Connect the 2500 Ω 5 watt wire-wound resistor between Z1 (NS) and Z2 (NS).
- () Run a wire from Z2 (S) to CC2 (S).
- () Connect the red 250 volt power transformer lead to Z1 (S).

- () Study Figure 3 and mount the grid clip on the grid clip test lead. Note that the metal clip section should be pulled out of the bakelite cap and the conductor of the test lead soldered to it. Do not use excessive solder as the clip is pushed back into the bakelite housing after the soldering has been completed.

NOTE: This clip will accomodate both sizes of grid caps found on radio receiving tubes.

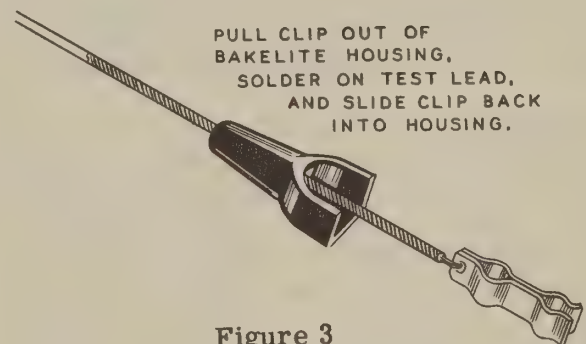


Figure 3

- () Dress the flexible grid clip wire through the small rubber grommet T from the panel side of the Tube Checker, remove 1/4" of insulation from the end of the wire, and tie the wire in a simple overhand knot about 1 1/2" from the end. Connect the flexible wire to R1 (S).
- () Pass the line cord through panel grommet E. Knot the cord as shown, and allow sufficient length to fasten one lead to DD2 (S) and the other lead to N1 (S).

METER MOUNTING

The 4 1/2" meter should now be removed from its carton for panel installation. First it will be necessary to remove the 6-32 screws and nuts which were temporarily installed to hold the two lug terminal strip R and the three lug terminal strip Q in place. Install the meter in the panel opening and slip the two and three lug terminal strips over the meter mounting studs. Use #6 lockwashers and 6-32 nuts to fasten the meter in place.

- () Connect a length of hookup wire from H3 (S) to meter terminal P2 (S).
- () Connect a length of hookup wire from Y2 (S) to meter terminal P1 (NS).
- () Connect a length of hookup wire from V3 (S) to meter terminal P1 (S).

This completes instrument construction and the knobs can now be installed on the panel controls. Install the large pointer knobs on the filament switch and the plate control. Index the filament switch knob so that in maximum counterclockwise position it indexes at the .75 volt position, and in maximum clockwise position it indexes at the 100-115 volt position. Install the plate control knob so that at its maximum counterclockwise position it indexes at zero, and in maximum clockwise position it indexes at 100. The SET LINE and TYPE knobs should also be installed in a similar manner. The lever switch buttons should now be installed on the lever switches. Inspection of the switch buttons will show that they must be correctly positioned before being pushed down on the switch arms. Two additional buttons have been supplied with your kit to be used as spares. Retain them for possible future use.

PRELIMINARY TESTS

Plug the line cord into a 117 volt AC 50 to 60 cycle supply source. Never use 25 cycle or DC supply voltage, as the power transformer will suffer severe damage. Turn the panel switch to its ON position. The roll chart panel lamps should immediately light, and the meter pointer will deflect to mid-scale. With the use of the SET LINE control, it should be possible to adjust the meter pointer to the meter line test position. It is normal for the range of adjustment to be on the high side of the meter, rather than toward the low end. This is understandable in view of the fact that when heavy current drain tubes, such as rectifiers drawing 2 and 3 amperes on the filament, are being tested, the reading will drop somewhat and it will be necessary for the SET LINE control to be readjusted to the line test position.

If the neon short lamp lights up during any of these preliminary tests, turn the Tube Checker off immediately and systematically trouble-shoot the circuit for possible cause of difficulty. The short test should not indicate any glow during the preliminary test procedure if the instrument is correctly wired. Should difficulty be encountered, a voltage check of the power transformer would be helpful. Use an AC voltmeter and refer to the schematic for the proper voltages that would normally be obtained at the various windings.

If preliminary tests indicate that the Tube Checker is functioning, the action of the checker can be further tested by making actual tests on a variety of tubes that may be available.

CABINET INSTALLATION

The Tube Checker can now be installed in the cabinet or carrying case. When the panel is in place, you will note that there has been a slight space provided between the cabinet wall and the edge of the panel to accomodate any small variations that may occur. After properly centering the panel, small holes should be drilled in the wood corner supports, so that the panel mounting screws can be installed. If a drill is not available, a starting hole can usually be made with a small, sharp screwdriver or a small awl.

USING THE HEATHKIT TC-2 TUBE CHECKER

The Heathkit Tube Checker will provide a number of varied tests and these are outlined in the steps below. The following steps should always be used as a guide in setting up tube testing procedure.

- (1) With power cord connected, move roll chart to listing of the tube to be tested, and turn SET LINE control until meter pointer is at LINE TEST point.
- (2) Set the TYPE switch to the number shown on the chart.
- (3) Set the FILAMENT selector to the voltage shown.
- (4) Set the PLATE control according to chart information.
- (5) Set LEVER switches to TOP and BOTTOM positions as shown in top and bottom columns in chart.
- (6) Insert tube and re-set the SET LINE control if necessary.

- (7) Check tube for short by moving levers shown in light type through the two positions returning to the positions shown on chart. A shorted tube is indicated by a steady glow of the neon bulb. Disregard neon bulb flashing as lever switches are moved. It is possible that some serious short circuits, such as plate to filament, will momentarily overload the power transformer. This condition will be indicated by complete dim out of the panel lamps. Do not allow the Tube Checker to operate under this extreme condition for any length of time. Make the test as quickly as possible in order to obtain the desired information.
- (8) Check tube for quality test by moving the test slide switch to TEST position after allowing sufficient time for the tube to reach operating temperature. If the meter pointer falls in the GREEN scale, the quality of the tube is GOOD.

TO TEST FOR OPEN ELEMENTS, PROCEED AS FOLLOWS:

- (1) Holding slide switch in TEST position, move each lever in the TOP position (only those in light type) to the BOTTOM position and return. Satisfactory tube elements (those properly connected to their pins) are indicated by a change in meter reading. The grid element usually shows a large change, while a screen or plate show only a slight change.

NOTE: If the meter indication in the quality test (step 8) is off scale, reduce the meter reading to an on-scale reading by turning the PLATE control, then proceed with the open element test.

TO CHECK FILAMENTS, FILAMENT TAPS, INTERNAL CONNECTIONS FOR CONTINUITY:

Set FILAMENT selector switch to .75. Move each lever shown in dark type through each of its other two positions. Always move only one lever at a time. Satisfactory filaments, taps and internal connections will be shown by a bright glow of the SHORT test indicator.

MULTIPLE TUBE TYPES:

Tubes which contain several sets of elements are indicated on the chart by a bracket set of listings, one for each test to be made on the tube. The tester is set up according to the tests in each line and checked through all of the tests as outlined above.

PILOT LIGHTS:

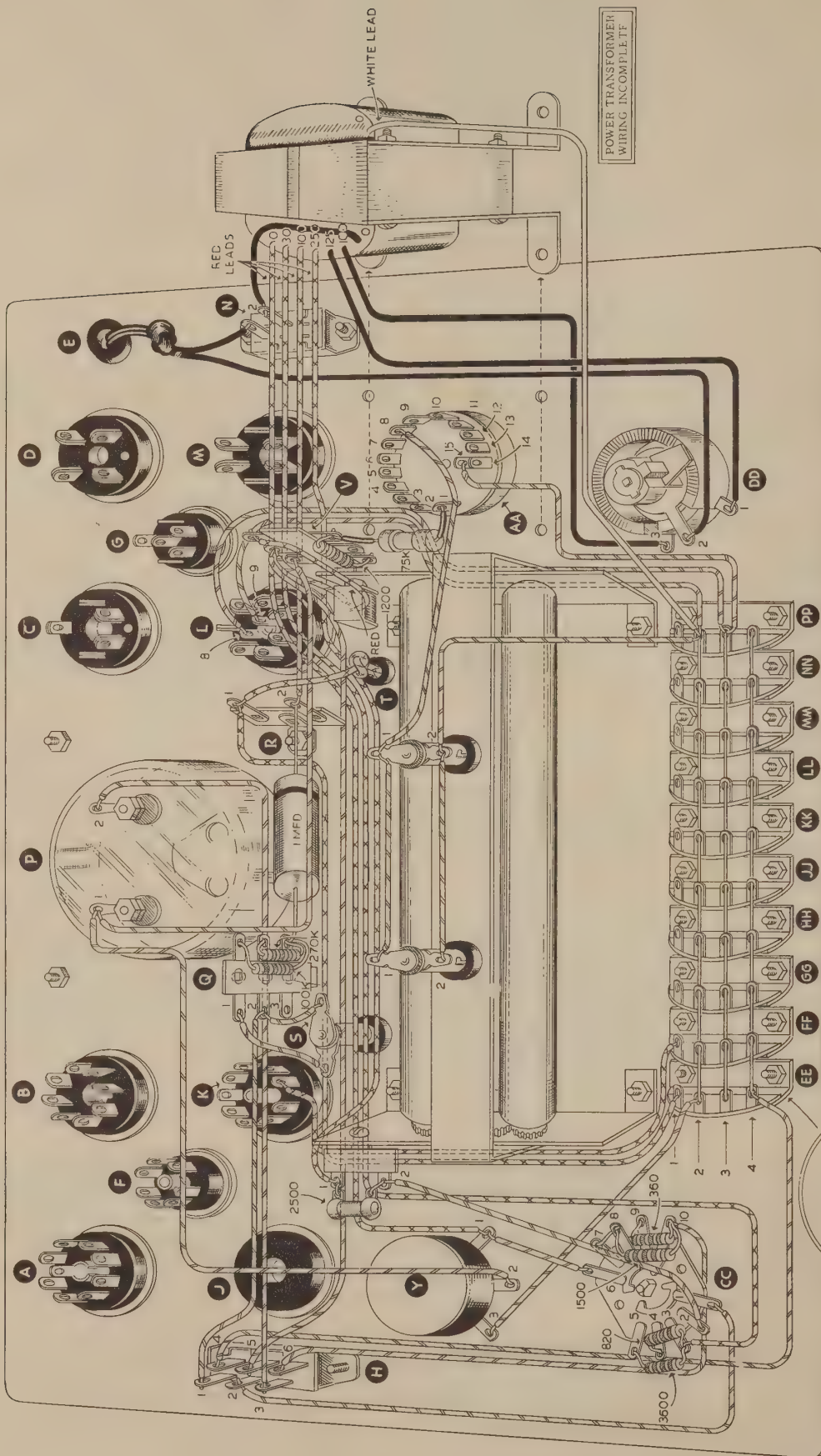
Check pilot lights by setting the FILAMENT selector switch to the proper voltage and inserting the pilot light in the socket found in the center of the seven pin socket. This is a universal contact-type pilot light test socket and does not require that the lamp be permanently inserted. It is merely necessary to hold the pilot lamp so that the side wall of the base and the center pin of the lamp make contact with the corresponding points in the lamp socket.

NEW TUBES:

The Heath Company periodically revises the Tube Checker roll chart in order to keep abreast of new tube releases. However, because of the great quantity of new tubes being released by manufacturers, a customer will occasionally desire to check a new tube before the test data appears on the roll chart. The instructions below will tell exactly how to set up the instrument for obtaining temporary settings so that these new tubes may be checked provided manufacturer's data is available.

- (a) Note manufacturer's data carefully concerning the base diagram of the pin connections and filament voltage.
- (b) Set the Tube Checker TYPE switch as follows:

Type 1 - for low cathode current tubes (below 4 ma) usually diode type tubes.



FINAL ASSEMBLY AND WIRING AFTER INSTALLATION OF TUBE SOCKET
SWITCH HARNESS WIRING.

Pictorial 5

HEATHKIT TUBE CHECKER
MODEL TC-2

- Type 2 - for cathode current tubes between 3 ma and 15 ma. These are usually filament type tubes with the exception of diodes.
- Type 3 - for cathode current type tubes greater than 8 ma. These are usually indirectly heated cathode types with the exception of diodes.
- Type 4 - for gas control tubes, gaseous rectifiers, and eye or target tubes.

- (c) Set filament voltage to values specified by manufacturer.
- (d) Set all levers to the center position.
- (e) Determine the first filament connection from the tube base diagram and leave its connection lever in the center position. Its connection lever can be found as follows: Lever A corresponds to pin 1. Lever B to pin 2. Lever C to pin 3, etc.
- (f) Determine the second filament connection from the tube base diagram and set its connection lever to the B (bottom) position.
- (g) Determine from base diagram if tube has a filament tap, and if so, set connection lever corresponding to tap to the B (bottom) position. Also determine from base diagram if tube has panel lamp.
- (h) If the tube has more than one section (duo diodes, duo triodes, etc.) make a separate test for each section. For the section being tested follow instructions below. For the section not being tested, move all corresponding connection levers to the B (bottom) position. If tube has only one section, follow instructions below.
- (i) Move the connection lever corresponding to the cathode to the B (bottom) position.
- (j) Move all other elements of the section being tested (screens, suppressors, grids, plate, etc.) to the T, top position.
- (k) Plug tube into correct socket.
- (l) Plug instrument into 105-125 volt, 50-60 cycle outlet and turn power on.
- (m) Adjust SET LINE control so that the meter indicates line test.
- (n) Hold the adjust line short-test switch in the test position and adjust plate voltage control to bring the pointer to the middle of the good scale. (If possible, make this adjustment for at least three new tubes and select the average setting.)
- (o) List all these settings in the manual.
- (p) If the tube is of the multi-section type check the remaining sections in the manner outlined above and list the settings in the manual.

SPECIAL SOCKET:

The Heath Company can supply a special acorn socket which can be installed in the blank socket panel position. The acorn socket is available from the Heath Company for a nominal charge of \$0.75, including installation and wiring instructions. It will be necessary to enlarge the blank socket panel opening slightly by using a file, and to drill two mounting holes for the acorn socket. In testing tubes of more than one top contact, a small grid clip lead can be made with a phone tip on the other end which can be inserted in a vacant socket contact and connected into the tester with the proper lever switch.

IN CASE OF DIFFICULTY

1. Recheck wiring. Follow each lead on the schematic with a colored pencil and trace it out on the instrument following the color code. Most cases of difficulty result from wrong or reversed connections. (Often having a friend check the wiring will reveal an error consistently being overlooked.)
2. Check the voltages as shown on the transformer wrapper at the connections of the transformer leads. This information is duplicated on the instrument schematic. This will show up mis-interpretation of the transformer lead identification.
3. Make continuity check between lever switch rotor contacts and various socket pins to make certain that all contacts are connected to levers.
4. The SET LINE control normally operates at a rather high temperature and affects part of its cooling through the aluminum panel. This does not indicate a fault.
5. If you are unable to locate the difficulty, write to the Heath Company technical consultation service department supplying all possible pertinent information. Include voltage data, as well as any characteristic of operation that may afford a clue to the difficulty. Trained, technical correspondents will analyze the problem and suggest the corrective measures that may be required.

REPLACEMENTS

Material supplied with Heathkits has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally improper instrument operation can be traced to a faulty tube or component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information:

- A. Thoroughly identify the part in question by using the part number and description found in the manual parts list.
- B. Identify the type and model number of kit in which it is used.
- C. Mention the order number and date of purchase.
- D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement. Please do not return the original component until specifically requested to do so. Do not dismantle the component in question as this will void the guarantee. If tubes are to be returned, pack them carefully to prevent breakage in shipment as broken tubes are not eligible for replacement. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

SERVICE

In event continued operational difficulties of the completed instrument are experienced, the facilities of the Heath Company Service Department are at your disposal. Your instrument may be returned for inspection and repair for a service charge of \$5.00 plus the cost of any additional material that may be required. **THIS SERVICE POLICY APPLIES ONLY TO COMPLETED INSTRUMENTS CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL.** Instruments that are not entirely completed or instruments that are modified in design will not be accepted for repair. Instruments showing evidence of acid core solder or paste fluxes will be returned not repaired.

The Heath Company is willing to offer its full cooperation to assist you in obtaining the specified performance level in your instrument. Factory repair service is available for a period of one year from the date of purchase or you may contact the Engineering Consultation Department by mail. For information regarding the possible modification of existing kits, the volumes listed in the Bibliography section are recommended. They can be obtained at or through your local library, as well as at any electronic outlet store. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for specific purposes. Therefore, such modifications must be made at the discretion of the kit builder according to information which will be much more readily available from some local source.

SHIPPING INSTRUCTIONS

Before returning a unit for service, be sure that all parts are securely mounted. Attach a tag to the instrument giving name, address and trouble experienced. Pack in a rugged container, preferably wood, using at least three inches of shredded newspaper or excelsior on all sides. DO NOT SHIP IN THE ORIGINAL KIT CARTON AS THIS CARTON IS NOT CONSIDERED ADEQUATE FOR SAFE SHIPMENT OF THE COMPLETED INSTRUMENT. Ship by prepaid express if possible. Return shipment will be made by express collect. Note that a carrier cannot be held liable for damage in transit if packing, in HIS OPINION, is insufficient.

SPECIFICATIONS

All prices are subject to change without notice. The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

WARRANTY

The Heath Company limits its warranty of parts supplied with any kit to a period of three (3) months from the date of purchase. Replacement will be made only when said part is returned postpaid, with prior permission and in the judgment of the Heath Company was defective at the time of sale. This warranty does not extend to any Heathkits which have been subjected to misuse, neglect, accident and improper installation or applications. Material supplied with a kit shall not be considered as defective, even though not in exact accordance with specifications, if it substantially fulfills performance requirements. This warranty is not transferable and applies only to the original purchaser. This warranty is in lieu of all other warranties and the Heath Company neither assumes nor authorizes any other person to assume for them any other liability in connection with the sale of Heathkits.

The assembler is urged to follow the instructions exactly as provided. The Heath Company assumes no responsibility for the operation of the completed instrument, nor liability for any damages or injuries sustained in the assembly or operation of the device.

HEATH COMPANY
Benton Harbor, Michigan

BIBLIOGRAPHY

Spangenberg, K. R. ; Vacuum Tubes
Brans, P. H. ; World's Radio Tubes

PARTS LIST
HEATHKIT TUBE CHECKER
MODEL TC-2

PART No.	PARTS Per Kit	DESCRIPTION	PART No.	PARTS Per Kit	DESCRIPTION
Resistors			Hardware		
1-5	1	360 Ω 5%	250-43	4	8-32 set screw
1-79	1	820 Ω 5%	250-9	35	6-32 x 3/8 screw
1-80	1	1200 Ω 5%	250-12	4	#6 x 5/8 sheet metal screw
1-81	1	1500 Ω 5%	252-3	37	6-32 x 1/4 nut
1-82	1	3600 Ω 5%	252-7	4	Control nut
1-26	1	100 K Ω	253-8	2	Flatwasher
1-30	1	270 K Ω	253-9	4	Brass washer
2-21A	1	75 K Ω precision	253-10	4	Flat nickel washer
3-1E	1	2500 Ω 5 watt wirewound	254-1	36	#6 lockwasher
			254-4	4	Control lockwasher
Condensers-Switches-Controls			Wire-Grommets		
11-14	1	200 Ω 25 watt	73-1	1	3/8 grommet
11-12	1	200 Ω wirewound	73-3	3	1/2 grommet
23-11	1	.1 μ fd tubular	73-4	1	5/16 grommet
60-1	1	SPST slide switch	89-1	1	Line cord
60-3	1	DPDT spring return slide	340-2	1	length Bare wire
62-1	10	SP, 3 position lever	341-1	1	Grid clip test lead
63-14	1	SP, 14 position rotary	344-1	1	roll Hookup wire
63-17	1	2-pole, 4 position rotary	346-1	1	length Insulated sleeving
			347-1	1	length 8-wire cable
Knobs-Sockets-Terminal Strips			Miscellaneous		
412-1	2	#47 panel lamp	54-8	1	Power transformer
412-3	1	NE51 bulb	57-6	1	Half wave rectifier
431-2	2	2 lug terminal strip	91-1	1	Cabinet
431-4	2	3 lug terminal strip	100-M9	1	Chart and roller assembly
434-1	1	Blank socket	203-40F14	1	Panel
434-4	1	Octal socket	204-M43	2	Roll chart bracket
434-9	1	4 prong socket	204-M44	1	Panel lamp bracket
434-10	1	Hytron 5 prong socket	260-3	1	Grid clip
434-11	1	5 prong socket	407-13	1	Tube checker meter
434-12	1	6 prong socket	451-1	1	Drive gear
434-13	1	7 prong socket	452-1	1	Drive gear pin
434-14	1	7 prong miniature socket	595-63	1	Manual
434-6	1	Loctal socket			
434-17	1	9 prong miniature socket			
434-21	3	Pilot light socket			
435-1	7	Octal socket rings			
435-2	2	Miniature socket rings			
435-3	1	Large socket ring			
100-M54	2	Large knob			
462-7	12	Lever switch knob			
462-19	2	Small skirted knob			

TEST DATA FOR SELDOM USED TUBES

FOR USE WITH HEATHKIT TC1, TC-2 and TC-2P TUBE CHECKERS

Lever switch settings on large type refer to continuity tests. See test procedure in manual.

Tube	Type	Fil.	Plate	Top	Bottom	Tube	Type	Fil.	Plate	Top	Bottom
OOA	2	5	30	bc	D	1V(KR-1)	3	6.3	24	b	cD
O1A	2	5	45	bc	D	2A3	3	2.5	28	bc	D
OA2	4	.75	40	AE	BDG	2A4	(1) 3	2.5	25	e	G
		(Good - 10)					(2) 3	2.5	25	c	eG
OY4	4	.75	22	e	cgh			(no short test)			
1A3	1	1.4	75	BF	cG	2A5(KR-25)	3	2.5	36	bcd	eF
1A4	1	2	28	bck	D	2A6	(1) 3	2.5	26	bk	eF
1A6	(1) 2	2	50	cd	F		(2) 1	2.5	40	d	eF
	(2) 1	2	95	bek	F		(3) 1	2.5	40	c	eF
1AB5	1	1.4	25	bcf	GH	2A7	(1) 2	2.5	32	e	fG
1B4	1	2	27	bck	D		(2) 2	2.5	64	bcdk	fG
1B4P(951)	2	2	35	bck	D	2B4	3	2.5	24	bc	dE
1B5(25S)	(1) 1	2	31	be	F	2B6	(1) 2	2.5	95	b	Fg
	(2) 1	2	40	d	F		(2) 3	2.5	50	cd	eG
	(3) 1	2	40	c	F	2B7	(1) 3	2.5	47	bck	fG
1B7	(1) 1	1.4	26	ef	G		(2) 1	2.5	40	e	fG
	(2) 1	1.4	95	cdk	G		(3) 1	2.5	40	d	FG
1C6	(1) 2	2	42	cd	F	2D21	3	6.3	18	aEfG	bD
	(2) 1	2	68	bek	F	2E5	(1) 2	2.5	44	bc	eF
1C7	(1) 2	2	41	ef	G	eye clsd.	(2) 4	2.5	0	bd	ceF
	(2) 1	2	56	cdk	G	eye open	(3) 4	2.5	0	d	bceF
1D5	2	2	39	cdk	G	2E24	3	2.5	22	cek	BG
1D5GP	2	2	33	cdk	G			(in short test A, D, F should show short when moved to top position)			
1D7	(1) 1	2	31	ef	G						
	(2) 1	2	95	cdk	G	2G5	(1) 2	2.5	44	bc	eF
1D8	(1) 2	1.4	48	fk	G	eye clsd.	(2) 4	2.5	0	bd	ceF
	(2) 2	1.4	37	cde	G	eye open	(3) 4	2.5	0	d	bceF
	(3) 1	1.4	95	h	G	2S/4S	(1) 1	2.5	45	c	dE
1E4	2	1.4	45	ce	G	(G-2)	(2) 1	2.5	45	b	dE
1E5	1	2	35	cdk	G	2V3	1	2.5	96	k	G
1E7	(1) 2	2	30	cdh	G			(Good - 20)			
	(2) 2	2	30	efh	G	2W3	2	2.5	36	d	H
1F4	3	2	47	bcd	E	2Z2(G84)	3	2.5	56	b	D
1F5	2	2	36	cde	G	3A5	(1) 2	1.4	30	bc	D
1F6	(1) 1	2	37	bck	F		(2) 2	1.4	30	ef	D
	(2) 1	2	95	d	F	3B5	2	1.4	35	cde	BG
	(3) 1	2	95	e	F	3B7(1291)	(1) 1	1.4	33	bc	AH
1F7(GV)	(1) 1	2	35	cfk	G		(2) 1	1.4	33	fg	AH
	(2) 1	2	95	e	G	4A6	(1) 2	2	35	cd	H
	(3) 1	2	95	d	G		(2) 3	2	46	ef	H
1G5	2	2	39	cde	G	5T4	(1) 3	5	26	f	H
1H4	2	2	41	ce	G		(2) 3	5	26	d	H
1H6	(1) 1	2	30	cf	G	5X3	(1) 3	5	43	b	D
	(2) 1	2	40	e	G		(2) 3	5	43	c	D
	(3) 1	2	40	d	G	6A3	3	6.3	28	bc	D
1J5	2	2	38	cde	G	6A4/LA(KR5)	3	6.3	36	bcd	E
1J6	(1) 2	2	39	cd	G	6A5	2	2.5	28	ce	BG
	(2) 2	2	39	ef	G	6A6	(1) 3	6.3	36	bc	DG
1N6	(1) 2	1.4	38	cde	G		(2) 3	6.3	36	ef	DG
	(2) 1	1.4	95	f	G	6A7	(1) 2	6.3	30	de	fG
		(Good - 20 on Test 2)					(2) 2	6.3	38	bck	fG
1R4(1294)	1	1.4	57	d	gH	6AB5	(1) 2	6.3	36	bc	eF
		(Good - 10)				eye clsd.	(2) 4	6.3	0	bd	ceF
1SA6	2	1.4	30	cdfh	G	eye open	(3) 4	6.3	0	d	bceF
1SB6	(1) 1	1.4	36	cdh	G	6AB6	(1) 3	6.3	62	de	cGh
	(2) 1	1.4	90	e	G		(2) 3	6.3	44	ce	dGh

Tube	Type	Fil.	Plate	Top	Bottom	Tube	Type	Fil.	Plate	Top	Bottom
6AB7(1853)	3	6.3	23	dfh	ceG	6G6	3	6.3	36	cde	Gh
6AD6	(1) 4	6.3	95	cde	Gh	6G6G	2	6.3	28	cde	Bh
		(Good - 26)				6G7	(1) 3	6.3	36	bk	Ceg
eye clsd.	(2) 4	6.3	0	cde	Gh		(2) 1	6.3	24	d	CG
eye open	(3) 4	6.3	0	e	cdGh		(3) 1	6.3	24	f	CG
6AD7	(1) 3	6.3	33	cde	Gh	6H4	1	6.3	26	d	Gh
	(2) 2	6.3	51	af	Gh	6H5	(1) 2	6.3	36	bc	eF
6AE5	3	6.3	29	ce	Gh	eye clsd.	(2) 4	6.3	0	bd	ceF
6AE6	(1) 2	6.3	33	ce	Gh	eye open	(3) 4	6.3	0	d	bceF
	(2) 2	6.3	33	de	Gh	6J4	2	6.3	20	AEFg	bD
6AE7	(1) 2	6.3	26	cd	eG	6P7	(1) 2	6.3	32	dek	Bh
	(2) 2	6.3	27	cf	Gh		(2) 3	6.3	70	fg	Bh
6AF5	2	6.3	24	ce	Gh	6Q6	(1) 1	6.3	20	ck	Gh
6AF6	(1) 4	6.3	95	cde	Gh		(2) 1	6.3	90	e	Gh
		(Good - 26)				6R6	3	6.3	41	cek	Gh
eye clsd.	(2) 4	6.3	0	cde	Gh	6SB7Y	(1) 2	6.3	22	de	afG
eye open	(3) 4	6.3	0	e	cdGh		(2) 1	6.3	34	cdh	efG
6AH7	(1) 3	6.3	30	ac	bG	6SV7	(1) 2	6.3	23	bdf	cH
	(2) 3	6.3	30	ef	dG		(2) 2	6.3	28	e	cH
6AL6	3	6.3	24	dek	Gh	6T5	(1) 1	6.3	24	bc	eF
6AQ7	(1) 1	6.3	22	de	fH	eye clsd.	(2) 4	6.3	0	bd	ceF
	(2) 1	6.3	34	c	bH	eye open	(3) 4	6.3	0	d	bceF
	(3) 1	6.3	34	a	bH	6T7	(1) 1	6.3	20	ck	Gh
6B5	(1) 3	6.3	45	bd	ceF		(2) 1	6.3	40	d	Gh
	(2) 3	6.3	63	cd	beF		(3) 1	6.3	40	e	Gh
6B6	(1) 3	6.3	32	ck	Gh	6V7	(1) 3	6.3	46	k	Gh
	(2) 1	6.3	40	d	Gh		(2) 1	6.3	50	d	Gh
	(3) 1	6.3	40	e	Gh		(3) 1	6.3	50	e	Gh
6B7	(1) 3	6.3	50	bck	fG	6W5	(1) 3	6.3	25	c	Gh
	(2) 1	6.3	40	d	fG		(2) 3	6.3	25	e	Gh
	(3) 1	6.3	40	e	fG	6Y3G	4	6.3	47	k	G
6B8	(1) 3	6.3	45	cfk	Gh	6Y5	(1) 3	6.3	28	c	dF
	(2) 1	6.3	40	d	Gh		(2) 3	6.3	28	e	dF
	(3) 1	6.3	40	e	Gh	6Y7	(1) 3	6.3	33	cd	Gh
6C6	1	6.3	21	bck	deF		(2) 3	6.3	33	ef	Gh
6C7	(1) 1	6.3	21	bk	fG	6Z3	3	6.3	24	b	cD
	(2) 1	6.3	40	d	fG	6Z4(84)	(1) 3	6.3	26	b	dE
	(3) 1	6.3	40	e	fG	(KR98)	(2) 3	6.3	26	c	dE
6C8	(1) 2	6.3	27	ck	dG	6Z5(12Z5)	(1) 3	6.3	25	c	BdF
	(2) 2	6.3	27	ef	Gh		(2) 3	6.3	25	e	BdF
6D5	3	6.3	32	ce	Gh	6Z7	(1) 3	6.3	32	cd	Gh
6D6	3	6.3	27	bcdk	eF		(2) 3	6.3	32	ef	Gh
6D7	2	6.3	28	bck	dfG	6ZY5	(1) 3	6.3	36	c	Gh
6D8	(1) 2	6.3	34	ef	Gh		(2) 3	6.3	36	e	Gh
	(2) 2	6.3	42	cdk	Gh	7A4 (XXL)	2	6.3	24	bf	gH
6E5	(1) 2	6.3	36	bc	eF	7A5	3	6.3	23	bcf	gH
eye open	(2) 4	6.3	0	d	bceF	7A6	(1) 1	6.3	28	c	bH
eye clsd.	(3) 4	6.3	0	bd	ceF		(2) 1	6.3	28	f	gH
6E6	(1) 3	6.3	31	bc	DG	7A7	3	6.3	28	bcf	dgH
	(2) 3	6.3	31	ef	DG	7A8	(1) 2	6.3	35	cd	gH
6E7	2	6.3	28	bck	DfG		(2) 2	6.3	44	bef	gH
6F7	(1) 3	6.3	43	bck	fG	7AB7	3	6.3	26	ace	DFGH
	(2) 3	6.3	82	de	fG	7B4	1	6.3	22	bf	gH
6F8	(1) 2	6.3	24	ck	dG	7B5	3	6.3	29	bcf	gH
	(2) 2	6.3	24	ef	Gh	7B6	(1) 2	6.3	25	bc	DGH
6G5(6U5)	(1) 2	6.3	36	bc	eF		(2) 1	6.3	58	e	DGH
eye clsd.	(2) 4	6.3	0	bd	ceF		(3) 1	6.3	58	f	DGH
eye open	(3) 4	6.3	0	d	bceF	7B7	2	6.3	28	bcf	dgH

Tube	Type	Fil.	Plate	Top	Bottom	Tube	Type	Fil.	Plate	Top	Bottom
7B8	(1) 2	6.3	28	cd	gH	14E6	(1) 3	12.6	31	bc	DGH
	(2) 2	6.3	34	bef	gH		(2) 1	12.6	65	e	DGH
7C5	3	6.3	29	bcf	gH		(3) 1	12.6	65	f	DGH
7C6	(1) 3	6.3	33	bc	DGH	14E7	(1) 2	12.6	28	bef	gH
	(2) 1	6.3	40	e	DGH		(2) 1	12.6	58	c	gH
	(3) 1	6.3	40	f	DGH		(3) 1	12.6	58	d	gH
7C7	1	6.3	22	bcf	dgH	14F7	(1) 1	12.6	20	cd	bH
7E6	(1) 2	6.3	27	bc	DGH		(2) 1	12.6	20	ef	gH
	(2) 1	6.3	45	e	DGH	14F8	(1) 3	12.6	22	ac	dG
	(3) 1	6.3	45	f	DGH		(2) 3	12.6	22	fh	eG
7E7	(1) 3	6.3	36	bef	gH	14J7	(1) 2	12.6	32	cde	fgH
	(2) 1	6.3	40	c	gH		(2) 3	12.6	33	bef	gH
	(3) 1	6.3	46	d	gH	14N7	(1) 2	12.6	26	cd	bH
7F7	(1) 1	6.3	20	cd	bH		(2) 2	12.6	26	ef	gH
	(2) 1	6.3	20	ef	gH	14Q7	(1) 2	12.6	25	cd	gH
7F8	(1) 2	6.3	22	ac	dG		(2) 2	12.6	30	bef	gH
	(2) 2	6.3	22	fh	eG	14S7	(1) 2	12.6	28	cd	gH
7G7(1232)	2	6.3	22	bcd	gH		(2) 2	12.6	24	bef	gH
7G8	(1) 2	6.3	24	bcd	efgH	14W7	2	12.6	22	bcf	DeGH
	(2) 2	6.3	24	ceg	bdfH	14Z3	3	12.6	25	b	cD
7J7	(1) 2	6.3	30	cde	gH	15	2	2	36	bck	dE
	(2) 2	6.3	30	bef	gH	15A6(PL83)	1	12.6	20	abfg	cE
7K7	(1) 1	6.3	20	cd	bH	16A5	3	12.6	18	bgj	cD
	(2) 1	6.3	39	e	gH	17	3	12.6	40	bc	dE
	(3) 1	6.3	39	f	gH	18	3	12.6	31	bcd	eF
7L7	2	6.3	26	bcf	dgH	19	(1) 3	2	37	bc	F
7N7	(1) 2	6.3	26	cd	bH		(2) 3	2	39	de	F
	(2) 2	6.3	26	ef	gH	20	2	6.3	48	bc	D
7Q7	(1) 2	6.3	25	cd	gH	22	1	2.5	56	bck	D
	(2) 2	6.3	41	bef	gH	24A	2	2.5	32	bck	dE
7S7	(1) 2	6.3	33	cd	gH	25A7	(1) 3	25	27	cde	Gh
	(2) 2	6.3	23	bef	gH		(2) 3	25	23	f	aG
7W7	2	6.3	24	bcf	DeGH	25AC5	3	25	31	ce	Gh
10	3	7.5	56	bc	D	25B5	(1) 3	25	37	bd	eF
10Y	3	7.5	42	bc	D		(2) 3	25	46	cd	beF
12A	2	5	26	bc	D	25B6	3	25	23	cde	Gh
12A5	3	6.3	32	bcd	eF	25B8	(1) 2	25	25	cdk	aG
12A7	(1) 2	12.6	29	bck	fG		(2) 2	25	25	eh	fG
	(2) 1	12.6	20	e	dG	25D8	(1) 2	25	26	ef	aG
12AH7	(1) 3	12.6	30	ac	bG		(2) 2	25	26	cdk	aG
	(2) 3	12.6	30	ef	dG		(3) 1	25	22	h	aG
12B8	(1) 2	12.6	26	cdk	aG	25N6	2	25	30	cde	Gh
	(2) 3	12.6	26	eh	fG	25Y5	(1) 3	25	30	b	cF
12L8G	(1) 3	12.6	20	cde	bG		(2) 3	25	30	e	dF
	(2) 3	12.6	22	aeh	bG	26	2	1.4	38	bc	D
12Z3	3	12.6	25	b	cD	26A6	2	25	22	abef	Dg
14	2	12.6	30	bck	dE	26A7	(1) 2	25	20	cde	bG
14A4	2	12.6	26	bf	gH		(2) 2	25	20	aeh	bG
14A5	3	12.6	33	bcf	gH	26C6	(1) 3	25	30	ag	bDef
14A7(12B7)	2	12.6	30	bcd	gH		(2) 1	25	36	e	abDfg
14B6	(1) 1	12.6	20	bc	DGH		(3) 1	25	36	f	abDeg
	(2) 1	12.6	40	e	DGH	26D6	(1) 2	25	22	af	bCeg
	(3) 1	12.6	40	f	DGH		(2) 1	25	40	efg	abC
14B8	(1) 2	12.6	34	cd	gH	27	2	2.5	32	bc	dE
	(2) 2	12.6	30	bef	gH	28Z5	(1) 3	12.6	38	c	AgH
14C5	3	12.6	25	bcf	gH		(2) 3	12.6	38	f	Dg
14C7	2	12.6	28	bcf	dgH	29	2	2.5	36	bc	deF

Tube	Type	Fil.	Plate	Top	Bottom	Tube	Type	Fil.	Plate	Top	Bottom
30	2	2	35	bc	D	78	3	6.3	31	bck	deF
31	2	2	40	bc	D	79	(1) 3	6.3	30	bc	dF
32	2	2	42	bck	D		(2) 3	6.3	30	ek	dF
32L7	(1) 3	32	21	cde	Gh	80	(1) 3	5	55	b	D
	(2) 3	32	18	f	aG		(2) 3	5	55	c	D
33	3	2	39	bcd	E	81	3	7.5	75	b	D
34	2	2	40	bck	D	82(82V)	(1) 3	2.5	24	b	D
35(51)	2	2.5	30	bck	dE		(2) 3	2.5	24	c	D
35A5	3	32	22	bcf	gH	83(83V)	(1) 3	5	26	b	D
35Z3	3	32	22	b	gH		(2) 3	5	26	c	D
35Z6	(1) 3	32	20	c	dG	85	(1) 3	6.3	45	bk	eF
	(2) 3	32	20	e	Gh		(2) 1	6.3	47	c	eF
36	2	6.3	32	bck	dE		(3) 1	6.3	47	d	eF
37	3	6.3	37	bc	dE	86M	3	6.3	37	ce	Gh
38	3	6.3	36	bck	dE	87S	2	6.3	33	bck	deF
39(44)	2	6.3	30	bck	dE	88	(1) 3	5	26	b	D
40	1	5	28	bc	D		(2) 3	5	26	c	D
40Z5(45Z5)	3	32	20	e	BCCh	88M	3	6.3	31	cdk	eGh
41	3	6.3	32	bcd	eF	88S	3	6.3	32	bck	deF
42	3	6.3	29	bcd	eF	89	3	6.3	32	bck	eF
43	3	25	31	bcd	eF	89RS	(1) 3	6.3	36	bk	CeG
45	3	2.5	32	bc	D		(2) 1	6.3	24	d	cG
46	3	2.5	35	bcd	E		(3) 1	6.3	24	f	cG
47	3	2.5	41	bcd	E	95	3	2.5	36	bcd	eF
48	3	32	25	bcd	eF	98	(1) 3	6.3	26	b	dE
49	2	2	38	bcd	E		(2) 3	6.3	26	c	dE
50(585)	3	7.5	42	bc	D	99(99XX99)	2	2.5	65	bc	D
50Z7	(1) 3	50	25	c	dFG	99V(V99)	2	2.5	65	ac	D
	(2) 3	50	25	e	FGh	113HY(123HY)	1	1.4	45	bc	E
52	3	6.3	30	bcd	E	114HY	3	1.4	55	k	G
53	(1) 3	2.5	32	bc	dG	(short top caps together)					
	(2) 3	2.5	32	ef	dG	115HY(145HY)	1	1.4	45	bcd	E
55	(1) 2	2.5	32	bk	eF	117N7	(1) 3	110	20	cde	fGh
	(2) 1	2.5	40	c	eF		(2) 3	110	15		Gh
	(3) 1	2.5	40	d	eF	(Allow tube to heat up. Return lever G to top position. Good tube will kick to 70.)					
56	2	2.5	30	bc	dE						
57	2	2.5	30	bck	deF	117P7	(1) 3	110	22	cde	fGh
57A(AS)	3	6.3	34	bck	deF		(2) 3	110	15		Gh
58	3	2.5	35	bck	deF	(Allow type to heat up. Return lever G to UP position. Good tube will kick to 70.)					
58AS	3	6.3	35	bck	deF						
59	3	2.5	29	bcde	fG	117Z4	3	110	19	e	Gh
64	1	6.3	22	bck	dE	128A/2523N1	4	2.5	20	bc	dE
65	2	6.3	28	bck	dE	182-B(482-B)	3	5	37	bc	D
67	3	6.3	37	bc	dE	183(483)	3	5	40	bc	D
68	3	6.3	37	bck	dE	201B	2	5	45	bc	D
70A7	(1) 3	70	23	cde	FGh	201C	2	5	45	bc	D
	(shows short on "A")					210T	3	7.5	56	bc	D
	(2) 3	70	20		aFG	230S	2	2	35	bc	D
	(Allow tube to heat up, return levers "F" and "G" to UP position. Good tube will kick to 70.)					233S	3	2	39	bcd	E
71A	3	5	47	bc	D	234S	2	2	40	bck	D
72	4	2.5	35	k	D	257A	2	2.5	41	bk	D
75	(1) 1	6.3	20	bk	eF	262B	3	7.5	42	bk	cD
	(2) 1	6.3	38	c	eF	274A	(1) 3	5	36	b	D
	(3) 1	6.3	38	d	eF		(2) 3	5	36	c	D
76	2	6.3	33	bc	dE	300B	3	5	21	bc	d
77	2	6.3	30	bck	deF	310B	2	7.5	28	bcd	Ae

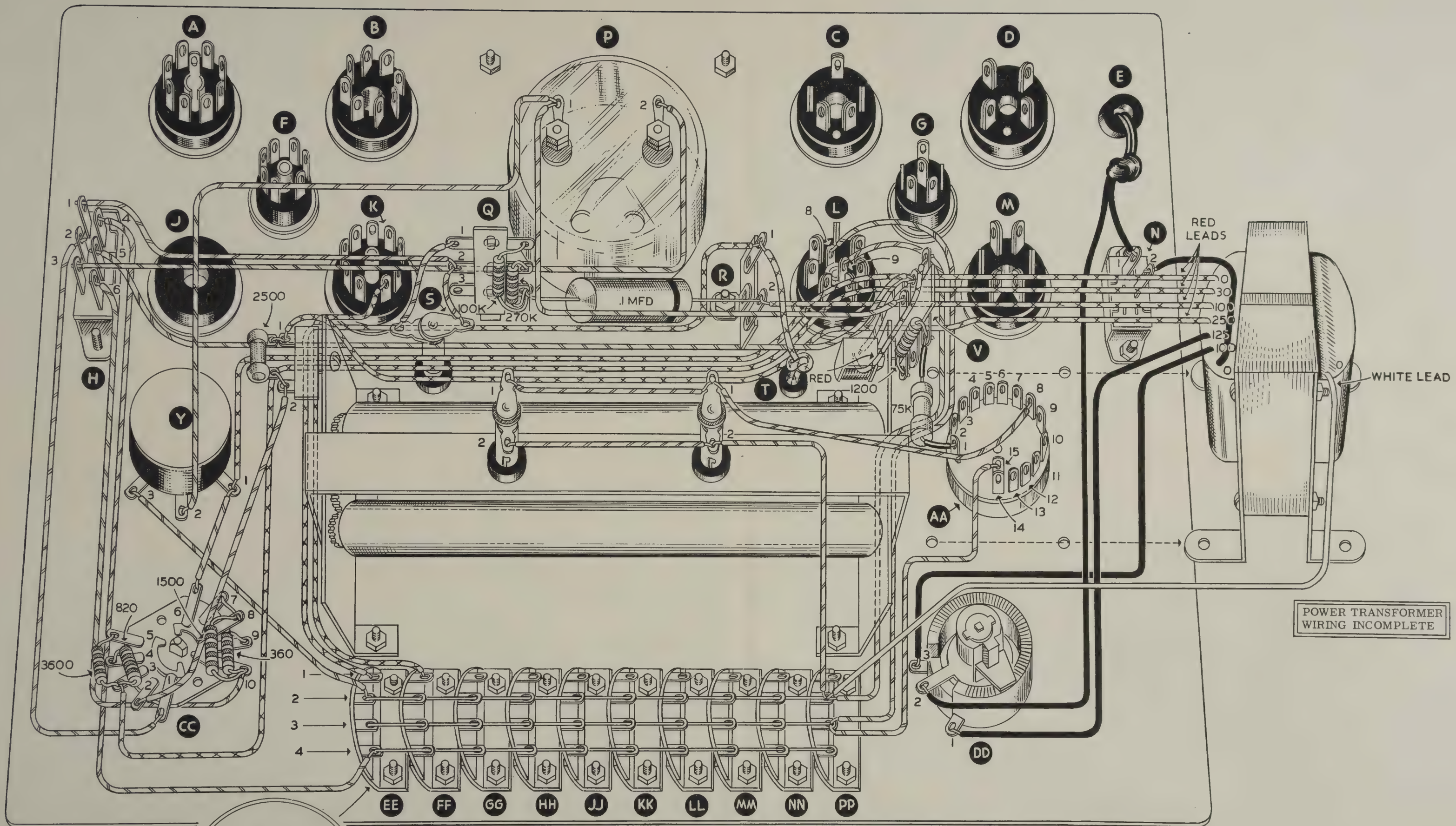
Tube	Type	Fil.	Plate	Top	Bottom	Tube	Type	Fil.	Plate	Top	Bottom
313C	4	.75	45	b	A	1223	1	6.3	22	cdk	eGh
313CB	4	.75	53	b	ad	1229	1	2	25	bck	D
313CD	4	.75	44	b	ad	1231	2	6.3	23	bcf	dgH
348A	1	6.3	24	cdek	Bh	1232	2	6.3	22	bcdf	gH
376B	4	.75	37	e	bg	1266	4	.75	95	e	bcg
393A	4	2.5	20	dk	AB	(Good tube reads 10. No open element on levers C and G. Tube normally shows short in short position.)					
427	3	2.5	44	bc	dE	1267	4	.75	31	e	BG
482A	3	5	47	bc	D						
484(485)	3	2.5	32	bc	dE	1275	(1) 3	5	30	b	cD
486	2	2.5	48	bc	dE	1293	(2) 3	5	30	c	bD
501X	1	1.4	35	cde	G						
502A(GL502A)	3	6.3	19	cef	gH	1612	3	6.3	25	dk	Gh
586	3	7.5	42	bc	D	9001	1	6.3	20	aef	BDG
605CX	2	6.3	22	abeg	Df	9002	2	6.3	27	AEf	BDG
606BX	2	6.3	23	a	Cd	9003	2	6.3	27	aef	BDG
608CX	3	6.3	20	ae	Df	9006	1	6.3	25	AE	BDG
615HY	3	6.3	33	k	G	AF	(1) 3	2.5	24	b	D
(short top caps together)											
619CX	2	6.3	25	ad	Ce	AG	(2) 3	2.5	24	c	D
713A	2	6.3	25	dfh	CEG						
717A	1	6.3	23	dfh	CEG	G4	(1) 1	2.5	45	c	dE
800	3	7.5	54	k	D						
(short top caps together)						GA	(2) 1	2.5	45	b	dE
801	3	7.5	42	bc	D						
802	3	6.3	29	cdk	efG	GL5663	3	5	32	bcd	E
809	3	6.3	27	ck	D	PZ	2	6.3	32	aeg	bC
812	3	6.3	29	ck	D	PZH	3	2.5	41	bcd	E
816	4	2.5	19	k	A	PZH	3	2.5	36	bcd	eF
816	4	2.5	19	k	A	R30	2	2	35	bc	D
837	3	12.6	25	cdk	efG	R100	2	2	35	bc	D
840	2	2	33	bck	dE	RK33	3	7.5	43	k	D
841	3	7.5	45	bc	D						
842	3	7.5	54	bc	D	(short top caps together)					
842	3	7.5	54	bc	D	RK34	(1) 3	6.3	27	de	fG
864	1	1.4	55	bc	dE						
864	1	1.4	55	bc	dE	RK34	(2) 3	6.3	27	ck	bG
865	3	7.5	80	bck	D						
865	3	7.5	80	bck	D	(top cap lead on left top cap)					
866(A)	3	2.5	25	k	D	RK34	(1) 3	6.3	27	ek	dG
885	4	2.5	20	bc	dE						
950	3	2	46	bcd	E	(top cap lead on right top cap)					
950	3	2	46	bcd	E	WL-481	4	2.5	59	k	D
986	(1) 3	5	26	b	D	WX-12	1	1.4	55	bc	D
986	(2) 3	5	26	c	D	WND-A	3	6.3	35	bc	deF
1003	(1) 4	.75	22	e	ch	WND-C	3	2.5	35	bc	deF
1003	(2) 4	.75	32	c	eh	XXFM	(1) 1	6.3	20	bc	dGH
1204	2	6.3	26	ace	DFGH	XXFM	(2) 1	6.3	27	e	dH
1221	1	6.3	22	bck	deF						
1221	1	6.3	22	bck	deF	(3) 1	6.3	27	f	gH	

The tube listings presented in this chart are offered as supplementary to the regular roll chart. Although they are designated as seldom used, most of them are still popular in specific types of applications. Therefore, this chart should be retained for future reference, even though there may be no immediate need for the data.

Each roll chart, supplied as a part of the Tube Checker kit models TC-1, TC-2 and TC-2P, contains data for checking all tubes generally encountered in normal service work. The supplementary list was compiled for the purpose of keeping the physical length of the regular chart at a minimum. This arrangement will facilitate the mechanical operation of the roll chart assembly.

VT No.	RMA No.	VT No.	RMA No.	VT No.	RMA No.
VT-24	864	VT-93A	6B8G	VT-164	1619
VT-25	10	VT-94	6J5	VT-165	1624
VT-26	22	VT-94A	6J5G	VT-167	6K8
VT-27	30	VT-94 B	6J5 Spec. Selec.	VT-168A	6Y6G
VT-28	24,24A	VT-94C	6J5G Spec. Selec.	VT-169	12C8
VT-29	27	VT-94D	6J5GT/G	VT-170	1E5-GP
VT-31	31	VT-95	2A3	VT-171	1R5
VT-33	33	VT-96	6N7	VT-172	1S5
VT-36	36	VT-96B	6N7 Spec. Selec.	VT-173	1T4
VT-37	37	VT-97	5W4	VT-174	3S4
VT-38	38	VT-98	6U5/6G5	VT-176	6AB7/1853
VT-40	40	VT-99	6F8G	VT-177	1LH4
VT-44	32	VT-100	807	VT-178	1LC6
VT-45	45	VT-101	837	VT-179	1LN5
VT-46A	866A	VT-103	6SQ7	VT-181	7Z4
VT-47	47	VT-104	12SQ7	VT-182	3B7/1291
VT-48	41	VT-105	6SC7	VT-183	1R4/1294
VT-49	39/44	VT-107	6V6	VT-184	VR90-30
VT-50	50	VT-107A	6V6GT	VT-185	306/1299
VT-51	841	VT-107B	6V6G	VT-188	7E6
VT-54	34	VT-112	6AC7/1852	VT-189	7F7
VT-55	865	VT-114	5T4	VT-190	7H7
VT-56	56	VT-115	6L6	VT-192	7A4
VT-57	57	VT-115A	6L6G	VT-193	7C7
VT-58	58	VT-116	6SJ7	VT-194	7J7
VT-62	801	VT-116A	6SJ7GT	VT-196	6W5G
VT-63	46	VT-116B	6SJ7Y	VT-198A	6G6G
VT-64	800	VT-117	6SK7	VT-199	6SS7
VT-65	6C5	VT-117A	6SK7GT	VT-200	VR105-30
VT-65A	6C5G	VT-119	2X2/879	VT-201	25L6
VT-66	6F6	VT-124	1A5GT	VT-201C	25L6GT
VT-66A	6F6G	VT-125	1C5GT	VT-202	9002
VT-67	30 Special	VT-126	6X5	VT-203	9003
VT-68	6B7	VT-126A	6X5G	VT-205	6ST7
VT-69	6D6	VT-126B	6X5GT	VT-206A	5V4G
VT-70	6F7	VT-131	12SK7	VT-207	12AH7GT
VT-72	842	VT-132	12K8	VT-208	7B8
VT-74	5Z4	VT-133	12SR7	VT-209	12SG7
VT-75	75	VT-134	12A6	VT-210	1S4
VT-76	76	VT-135	12J5GT	VT-211	6SG7
VT-77	77	VT-135A	12J5	VT-213A	6L5G
VT-78	78	VT-136	1625	VT-214	12H6
VT-80	80	VT-137	1626	VT-215	6E5
VT-83	83	VT-138	1629	VT-222	884
VT-84	84/6Z4	VT-139	VR150-30	VT-223	1H5GT
VT-86	6K7	VT-145	5Z3	VT-224	2C34/RK34
VT-86A	6K7G	VT-146	1N5GT	VT-229	6SL7
VT-86B	6K7GT	VT-147	1A7GT	VT-231	6SN7GT
VT-87	6L7	VT-148	1D8GT	VT-233	6SR7
VT-87A	6L7G	VT-149	3A8GT	VT-239	1LE3
VT-88	6R7	VT-150	6SA7	VT-241	7E5/1201
VT-88A	6R7G	VT-150A	6SA7GT	VT-243	7C4/1203A
VT-88B	6R7GT	VT-151	6A8G	VT-244	5U4G
VT-89	89	VT-151B	6A8GT	VT-245	2050
VT-90	6H6	VT-152	6K6GT	VT-247	6AG7
VT-90A	6H6GT	VT-152A	6K6G	VT-260	VR75-30
VT-91	6J7	VT-153	12C8	VT-264	3Q4
VT-91A	6J7GT	VT-161	12SA7	VT-268	12SC7
VT-92	6Q7	VT-162	12SJ7	VT-288	12SH7
VT-93	6B8	VT-163	6C8G	VT-289	12SL7GT

VT No.	RMA No.	VT No.	RMA No.	VT No.	RMA No.
VT-24	864	VT-93A	6B8G	VT-164	1619
VT-25	10	VT-94	6J5	VT-165	1624
VT-26	22	VT-94A	6J5G	VT-167	6K8
VT-27	30	VT-94B	6J5 Spec. Selec.	VT-168A	6Y6G
VT-28	24,24A	VT-94C	6J5G Spec. Selec.	VT-169	12C8
VT-29	27	VT-94D	6J5GT/G	VT-170	1E5-GP
VT-31	31	VT-95	2A3	VT-171	1R5
VT-33	33	VT-96	6N7	VT-172	1S5
VT-36	36	VT-96B	6N7 Spec. Selec.	VT-173	1T4
VT-37	37	VT-97	5W4	VT-174	3S4
VT-38	38	VT-98	6U5/6G5	VT-176	6AB7/1853
VT-40	40	VT-99	6F8G	VT-177	1LH4
VT-44	32	VT-100	807	VT-178	1LC6
VT-45	45	VT-101	837	VT-179	1LN5
VT-46A	866A	VT-103	6SQ7	VT-181	7Z4
VT-47	47	VT-104	12SQ7	VT-182	3B7/1291
VT-48	41	VT-105	6SC7	VT-183	1R4/1294
VT-49	39/44	VT-107	6V6	VT-184	VR90-30
VT-50	50	VT-107A	6V6GT	VT-185	306/1299
VT-51	841	VT-107B	6V6G	VT-188	7E6
VT-54	34	VT-112	6AC7/1852	VT-189	7F7
VT-55	865	VT-114	5T4	VT-190	7H7
VT-56	56	VT-115	6L6	VT-192	7A4
VT-57	57	VT-115A	6L6G	VT-193	7C7
VT-58	58	VT-116	6SJ7	VT-194	7J7
VT-62	801	VT-116A	6SJ7GT	VT-196	6W5G
VT-63	46	VT-116B	6SJ7Y	VT-198A	6G6G
VT-64	800	VT-117	6SK7	VT-199	6SS7
VT-65	6C5	VT-117A	6SK7GT	VT-200	VR105-30
VT-65A	6C5G	VT-119	2X2/879	VT-201	25L6
VT-66	6F6	VT-124	1A5GT	VT-201C	25L6GT
VT-66A	6F6G	VT-125	1C5GT	VT-202	9002
VT-67	30 Special	VT-126	6X5	VT-203	9003
VT-68	6B7	VT-126A	6X5G	VT-205	6ST7
VT-69	6D6	VT-126B	6X5GT	VT-206A	5V4G
VT-70	6F7	VT-131	12SK7	VT-207	12AH7GT
VT-72	842	VT-132	12K8	VT-208	7B8
VT-74	5Z4	VT-133	12SR7	VT-209	12SG7
VT-75	75	VT-134	12A6	VT-210	1S4
VT-76	76	VT-135	12J5GT	VT-211	6SG7
VT-77	77	VT-135A	12J5	VT-213A	6L5G
VT-78	78	VT-136	1625	VT-214	12H6
VT-80	80	VT-137	1626	VT-215	6E5
VT-83	83	VT-138	1629	VT-222	884
VT-84	84/6Z4	VT-139	VR150-30	VT-223	1H5GT
VT-86	6K7	VT-145	5Z3	VT-224	2C34/RK34
VT-86A	6K7G	VT-146	1N5GT	VT-229	6SL7
VT-86B	6K7GT	VT-147	1A7GT	VT-231	6SN7GT
VT-87	6L7	VT-148	1D8GT	VT-233	6SR7
VT-87A	6L7G	VT-149	3A8GT	VT-239	1LE3
VT-88	6R7	VT-150	6SA7	VT-241	7E5/1201
VT-88A	6R7G	VT-150A	6SA7GT	VT-243	7C4/1203A
VT-88B	6R7GT	VT-151	6A8G	VT-244	5U4G
VT-89	89	VT-151B	6A8GT	VT-245	2050
VT-90	6H6	VT-152	6K6GT	VT-247	6AG7
VT-90A	6H6GT	VT-152A	6K6G	VT-260	VR75-30
VT-91	6J7	VT-153	12C8	VT-264	3Q4
VT-91A	6J7GT	VT-161	12SA7	VT-268	12SC7
VT-92	6Q7	VT-162	12SJ7	VT-288	12SH7
VT-93	6B8	VT-163	6C8G	VT-289	12SL7GT



FINAL ASSEMBLY AND WIRING AFTER INSTALLATION OF TUBE SOCKET
SWITCH HARNESS WIRING.

Pictorial 5

HELPFUL KIT BUILDING INFORMATION

Before attempting actual kit construction read the construction manual through thoroughly to familiarize yourself with the general procedure. Note the relative location of pictorials and pictorial inserts in respect to the progress of the assembly procedure outlined.

This information is offered primarily for the convenience of novice kit builders and will be of definite assistance to those lacking thorough knowledge of good construction practices. Even the advanced electronics enthusiast may benefit by a brief review of this material before proceeding with kit construction. In the majority of cases, failure to observe basic instruction fundamentals is responsible for inability to obtain desired level of performance.

RECOMMENDED TOOLS

The successful construction of Heathkits does not require the use of specialized equipment and only basic tools are required. A good quality electric soldering iron is essential. The preferred size would be a 100 watt iron with a small tip. The use of long nose pliers and diagonal or side cutting pliers is recommended. A small screw driver will prove adequate and several additional assorted screw drivers will be helpful. Be sure to obtain a good supply of rosin core type radio solder. Never use separate fluxes, paste or acid solder in electronic work.

ASSEMBLY

In the actual mechanical assembly of components to the chassis and panel, it is important that the procedure shown in the manual be carefully followed. Make sure that tube sockets are properly mounted in respect to keyway or pin numbering location. The same applies to transformer mountings so that the correct transformer color coded wires will be available at the proper chassis opening.

Make it a standard practice to use lock washers under all 6-32 and 8-32 nuts. The only exception being in the use of solder lugs—the necessary locking feature is already incorporated in the design of the solder lugs. A control lock washer should always be used between the control and the chassis to prevent undesirable rotation in the panel. To improve instrument appearance and to prevent possible panel marring use a control flat nickel washer under each control nut.

When installing binding posts that require the use of fiber insulating washers, it is good practice to slip the shoulder washer over the binding post mounting stud before installing the mounting stud in the panel hole provided. Next, install a flat fiber washer and a solder lug under the mounting nut. Be sure that the shoulder washer is properly centered in the panel to prevent possible shorting of the binding post.

WIRING

When following wiring procedure make the leads as short and direct as possible. In filament wiring requiring the use of a twisted pair of wires allow sufficient slack in the wiring that will permit the twisted pair to be pushed against the chassis as closely as possible thereby affording relative isolation from adjacent parts and wiring.

When removing insulation from the end of hookup wire, it is seldom necessary to expose more than a quarter inch of the wire. Excessive insulation removal may cause a short circuit condition in respect to nearby wiring or terminals. In some instances, transformer leads of solid copper will have a brown baked enamel coating. After the transformer leads have been trimmed to a suitable length, it is necessary to scrape the enamel coating in order to expose the bright copper wire before making a terminal or soldered connection.

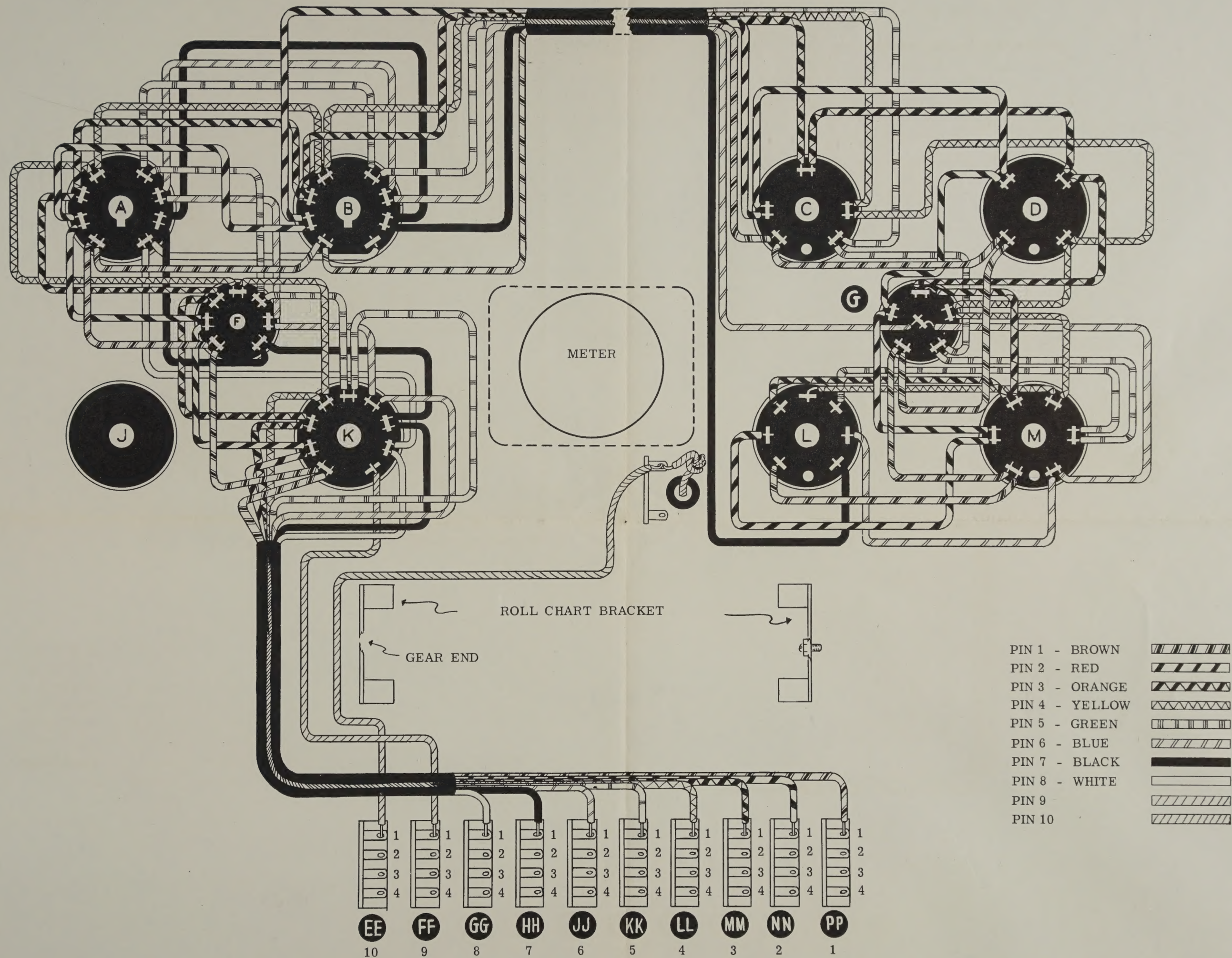
In mounting parts such as resistors or condensers, trim off all excess lead lengths so that the parts may be installed in a direct point-to-point manner. When necessary use spaghetti or insulated sleeving over exposed wires that might short to nearby wiring.

It is urgently recommended that the wiring dress and parts layout as shown in the construction manual be faithfully followed. In every instance, the desirability of this arrangement was carefully determined through the construction of a series of laboratory models.

SOLDERING

Much of the performance of the kit instrument, particularly in respect to accuracy and stability, depends upon the degree of workmanship used in making soldered connections. Proper soldered connections are not at all difficult to make but it would be advisable to observe a few precautions. First of all before a connection is to be soldered, the connection itself should be clean and mechanically strong. Do not depend on solder alone to hold a connection together. The tip of the soldering iron should be bright, clean and free of excess solder. Use enough heat to thoroughly flow the solder smoothly into the joint. Avoid excessive use of solder and do not allow a flux flooding condition to occur which could conceivably cause a leakage path between adjacent terminals on switch assemblies and tube sockets. This is particularly important in instruments such as the VTVM, oscilloscope and generator kits. Excessive heat will also burn or damage the insulating material used in the manufacture of switch assemblies. Be sure to use only good quality rosin core radio type solder.

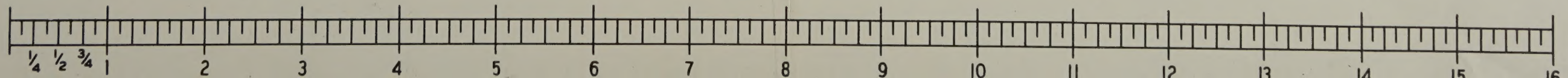
Antenna General		Resistor General		Neon Bulb		Receptacle two-conductor	
Loop		Resistor Tapped		Illuminating Lamp		Battery	
Ground		Resistor Variable		Switch Single pole Single throw		Fuse	
Inductor General		Potentiometer		Switch double pole single throw		Piezoelectric Crystal	
Air core Transformer General		Thermistor		Switch Triple pole Double throw		1000 =	K
Adjustable Powdered Iron Core		Jack two conductor		Switch Multipoint or Rotary		1,000,000 =	M
Magnetic Core Variable Coupling		Jack three conductor		Speaker		OHM =	Ω
Iron Core Transformer		Wires connected		Rectifier		Microfarad =	MF
Capacitor General		Wires Crossing but not connected		Microphone		Micro Microfarad =	MMF
Capacitor Electrolytic		A. Ammeter V. Voltmeter		Typical tube symbol 		Binding post Terminal strip	
Capacitor Variable		G. Galvanometer MA. Milliammeter uA. Microammeter, etc.				Wiring between like letters is understood	



CORRESPONDING PIN NUMBERS

Pictorial 3
Harness Wiring

HEATHKIT TUBE CHECKER
MODEL TC-2



HELPFUL KIT BUILDING INFORMATION

Before attempting actual kit construction read the construction manual through thoroughly to familiarize yourself with the general procedure. Note the relative location of pictorials and pictorial inserts in respect to the progress of the assembly procedure outlined.

This information is offered primarily for the convenience of novice kit builders and will be of definite assistance to those lacking thorough knowledge of good construction practices. Even the advanced electronics enthusiast may benefit by a brief review of this material before proceeding with kit construction. In the majority of cases, failure to observe basic instruction fundamentals is responsible for inability to obtain desired level of performance.

RECOMMENDED TOOLS

The successful construction of Heathkits does not require the use of specialized equipment and only basic tools are required. A good quality electric soldering iron is essential. The preferred size would be a 100 watt iron with a small tip. The use of long nose pliers and diagonal or side cutting pliers is recommended. A small screw driver will prove adequate and several additional assorted screw drivers will be helpful. Be sure to obtain a good supply of rosin core type radio solder. Never use separate fluxes, paste or acid solder in electronic work.

ASSEMBLY

In the actual mechanical assembly of components to the chassis and panel, it is important that the procedure shown in the manual be carefully followed. Make sure that tube sockets are properly mounted in respect to keyway or pin numbering location. The same applies to transformer mountings so that the correct transformer color coded wires will be available at the proper chassis opening.

Make it a standard practice to use lock washers under all 6-32 and 8-32 nuts. The only exception being in the use of solder lugs—the necessary locking feature is already incorporated in the design of the solder lugs. A control lock washer should always be used between the control and the chassis to prevent undesirable rotation in the panel. To improve instrument appearance and to prevent possible panel marring use a control flat nickel washer under each control nut.

When installing binding posts that require the use of fiber insulating washers, it is good practice to slip the shoulder washer over the binding post mounting stud before installing the mounting stud in the panel hole provided. Next, install a flat fiber washer and a solder lug under the mounting nut. Be sure that the shoulder washer is properly centered in the panel to prevent possible shorting of the binding post.

WIRING

When following wiring procedure make the leads as short and direct as possible. In filament wiring requiring the use of a twisted pair of wires allow sufficient slack in the wiring that will permit the twisted pair to be pushed against the chassis as closely as possible thereby affording relative isolation from adjacent parts and wiring.

When removing insulation from the end of hookup wire, it is seldom necessary to expose more than a quarter inch of the wire. Excessive insulation removal may cause a short circuit condition in respect to nearby wiring or terminals. In some instances, transformer leads of solid copper will have a brown baked enamel coating. After the transformer leads have been trimmed to a suitable length, it is necessary to scrape the enamel coating in order to expose the bright copper wire before making a terminal or soldered connection.

In mounting parts such as resistors or condensers, trim off all excess lead lengths so that the parts may be installed in a direct point-to-point manner. When necessary use spaghetti or insulated sleeving over exposed wires that might short to nearby wiring.

It is urgently recommended that the wiring dress and parts layout as shown in the construction manual be faithfully followed. In every instance, the desirability of this arrangement was carefully determined through the construction of a series of laboratory models.

SOLDERING

Much of the performance of the kit instrument, particularly in respect to accuracy and stability, depends upon the degree of workmanship used in making soldered connections. Proper soldered connections are not at all difficult to make but it would be advisable to observe a few precautions. First of all before a connection is to be soldered, the connection itself should be clean and mechanically strong. Do not depend on solder alone to hold a connection together. The tip of the soldering iron should be bright, clean and free of excess solder. Use enough heat to thoroughly flow the solder smoothly into the joint. Avoid excessive use of solder and do not allow a flux flooding condition to occur which could conceivably cause a leakage path between adjacent terminals on switch assemblies and tube sockets. This is particularly important in instruments such as the VTVM, oscilloscope and generator kits. Excessive heat will also burn or damage the insulating material used in the manufacture of switch assemblies. Be sure to use only good quality rosin core radio type solder.

Antenna General		Resistor General		Neon Bulb		Receptacle two-conductor	
Loop		Resistor Tapped		Illuminating Lamp		Battery	
Ground		Resistor Variable		Switch Single pole Single throw		Fuse	
Inductor General		Potentiometer		Switch double pole single throw		Piezoelectric Crystal	
Air core Transformer General		Thermistor		Switch Triple pole Double throw		1000 =	K
Adjustable Powdered Iron Core		Jack two conductor		Switch Multipoint or Rotary		1,000,000 =	M
Magnetic Core Variable Coupling		Jack three conductor		Speaker		OHM =	Ω
Iron Core Transformer		Wires connected		Rectifier		Microfarad =	MF
Capacitor General		Wires Crossing but not connected		Microphone		Micro Microfarad =	MMF
Capacitor Electrolytic		A. Ammeter V. Voltmeter		Typical tube symbol 		Binding post Terminal strip	
Capacitor Variable		G. Galvanometer MA. Milliammeter uA. Microammeter, etc.				Wiring between like letters is understood	

HEATH COMPANY

A Subsidiary of Daystrom Inc.

THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

BENTON HARBOR, MICHIGAN